Playing with Geoengineered Futures:
Excogitations on Scenarios, Politics, and Postnormal Potentialities

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Dedication

For my family

Acknowledgements

While I still believe that dropping out of high school at 15 was excellent preparation for being a futurist, I can also say that my journey from GED (general education diploma) to PhD was an improbable one. There should be little doubt that I have been the beneficiary of extraordinary generosity and support along the way. These attributes are embodied in my dissertation committee, who not only provided critical feedback but whose trust in me as a scholar means more than words can express.

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I would not have come to Hawaiʻi were it not for the nudging and wondrous stories of my undergraduate advisor, Dr. David Jones. He taught me how to think and, perhaps most importantly, that these islands were a special place to think. I am indebted to him as well as the extraordinary colleagues and friends who constituted the Philosophy Student Association at Kennesaw State University.

My parents, John and Patricia, have been constant cheerleaders and tireless advocates. They encouraged me to dream and were always there when reality kicked in. I am not sure that I was the best brother to grow up alongside, but Lee made the best of it and ended up making me better along the way. My godparents, Salvatore and Naki, and my aunt, Lee,

always expressed confidence in my abilities. In life, the richest amongst us draw wealth as love from our families, and in this regard, I have been unequally blessed.

Truly loving someone is a selfless act, and my wife, Iryna, embodies this fully and completely. As my best friend and life partner, she inspires me to be better in all things. How I think about the future(s) has changed since the birth of my son, Eduard. Growing up in postnormal times will certainly make his life interesting, and it is my hope that, in some way, this work contributes toward a preferred future for him.

Abstract

Given the terrifying potentialities linked to global warming, some have suggested that the only means of abating a worst-case scenario is to double down, so to speak. Geoengineering is the intentional manipulation and augmentation of the global climate system. Critics and enthusiasts have commenced a lively debate around this complex issue, and scenarios have recently emerged as a constitutive practice to confront the uncertainties permeating research, implementation, and prospective governance. Using a synthesis of critical political frames to engage with a range of geoengineered imaginaries, this dissertation employs both textual and practice-based modes of research to argue that there are more dynamic and efficacious means to engage people in thinking through the radical possibilities and postnormal potentialities inherent to geoengineering. Turning to games and deploying play as a modality for experimentation, this dissertation assembles a design for exploring the core themes of the debate and enacting an embodied politics for geoengineering. *GeoFutr* is an alternative futures-driven gaming platform designed to critique, create, and ultimately contest geoengineered imaginaries.

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Introduction

Organic gardening, not rocket science[1]

In 2007, Russ George intimated to the *New York Times* that his proposed ocean iron fertilization (hereafter OIF) project was "organic gardening, not rocket science" (Richtel 2007). By enhancing the ocean's biological pump, OIF can produce carbon-absorbing plankton blooms, which creates a literal sink for carbon dioxide (hereafter CO_2) and provides an essential ingredient for oceanic life systems. While the outspoken entrepreneur's candor was likely intended to raise funds from investors, as well as a few eyebrows, George's 2007 experiment ultimately failed to materialize—if only because of pressure from the U.S. Environmental Protection Agency (hereafter EPA) and other concerned parties (Hester 2013, 273).

In spite of his detractors, George continued exalting the positive effects of OIF as a means to combat climate change and, perhaps not surprisingly, seed a profitable enterprise. Many, however, within the scientific community are weary of accelerating, or further modifying already stressed, oceanic systems, especially as a number of studies suggest that only a small percentage of the sequestered CO_2 remains

[1] Portions of this dissertation have been published in peer-reviewed journals and as book chapters over the past four years. Specifically, the introduction and chapter two draw from Sweeney (2013; 2014) and my contributions to Sweeney et al. (In press). Chapter four pulls extensively from Sweeney (2017).

effectively stored and, perhaps most importantly, the overall effects of large-scale OIF interventions on oceanic life systems are uncertain (Batten and Gower 2014; Bodansky 1996; Bodle et al. 2012; Burns and Strauss 2013; Courvoisier et al. 2018; Fuentes-George 2017; IPCC 2012; National Research Council 2015a; Royal Society 2009; Williamson et al. 2012a; Williamson et al. 2012b).

Notwithstanding scientific and legal challenges, a recalcitrant George did not waiver from seeking to produce "lucrative carbon credits to trade on international markets" and generating invaluable data to legitimate future experiments (Specter 2012). In 2012, George finally realized his vision, at least in part. Coordinating an effort to dump 100 tons of iron sulfate off the coast of northern British Columbia, George appears to have convinced the Haida Nation to support a "salmon enhancement project" and received $2.5 million from the First Nations community to carry out his "research" (Lukacs 2012a). While there have been reports that George's OIF experiment created a plankton bloom of "10,000 square kilometers" (Parson 2012), many were more interested in the region's record salmon yields that followed, although some contend that it is difficult, if not impossible, to make such causal, or even correlational, linkages (Johnson 2013; Learn 2014). Many, if not most, within both the scientific and environmental protection communities condemned George's maverick approach to "research" (Hume 2012), but

mainstream calls to carry out further experiments (Güssow et al. 2013) have surfaced since the 2012 incident, whose purported success led some to herald further opportunities for “unleashing abundance” (Zubrin 2014).

In light of the media buzz surrounding the experiment, the Haida Salmon Restoration Corporation (HSRC) has done its utmost to distance itself from George, who was removed from his position as Director with the company in 2013. Arguing that they were intentionally misled, the HSRC voiced concerns as to whether George’s project might have contravened the 1972 London Convention on marine dumping and a 2010 United Nations Convention on Biodiversity, which specifically “calls for precaution in the absence of an adequate scientific basis on which to justify intentional climate modification activities and appropriate consideration of the associated risks for the environment and biodiversity, and associated social, economic and cultural impacts” (Williamson et al. 2012a, 18). The 2010 Convention does allow for small-scale experiments that "are conducted in a controlled setting, scientifically justified and subject to prior environmental impact assessments […]” (Williamson et al. 2012a, 141). The Planktos experiment did not meet any of the aforementioned criteria.

George appears to have escaped legal penalty, although some have stated publicly that the dumping was illegal, which points toward possible hurdles ahead for future experiments—should they be undertaken (Hume 2012). Ultimately, the Planktos incident illuminates the lack of a

comprehensive regulatory framework for research and potential deployment, enforcement obstacles and chasms within international law, and the absence of an overarching governance treaty on geoengineering (Bipartisan Policy Centre Task Force on Climate Remediation Research 2011; Bodansky 1996; Brent et al. 2018; Cicerone et al. 1992; Cicerone 2006; Crutzen 2006; Fleming 2010; Hamilton 2013; Horton et al. 2015; House of Commons Science and Technology Committee 2010; Kintisch 2010; Klein 2014; Payne et al. 2015; Royal Society 2009; Stilgoe 2015; Stilgoe 2016; Victor 2008). Furthermore, the Planktos incident highlights the potentiality for geoengineering to be used as a tool for further exploitation of communities already on the frontlines of environmental degradation and climate change. Writing in anticipation of such events, Whyte presciently observes:

> For many Indigenous peoples, [geoengineering] represents a particular, global path-dependence for responding to climate change that will simply sweep them up before they have had any chance to influence or meaningfully consent to various courses of action. Non-Indigenous persons push to gain support and fund even early research represents an emerging crystallization of a commitment that will give some people greater capacity to impact the climate system (2012, 175).

As with the diffuse effects of global warming, climate engineering presents another threat to *collective continuance*, which "is a community's capacity to be adaptive in ways sufficient for the livelihoods of its members to flourish into the future" (Whyte 2013). In failing to confront the historical

and continuing injustice(s) faced by native communities, George's positionality is quite clear: experimentation *upon* rather than *with* communities like the Haida Nation.

In light of his contention that he only works "to restore nature," George invokes a modernist fable (2013).[2] The Romantic construction of the natural world as something static, manageable, and ultimately under the purview of human control is precisely what enabled "progress" to facilitate and enact a host of crises and genocides. Furthermore, the perpetuation of a separation between nature and culture positioned Western "science" as the proverbial go-between for understanding, classifying, and ultimately knowing the world (Morton 2007; Morton 2010).[3] As Latour reflects:

> So long as Nature was remote and under control, it still vaguely resembled the constitutional pole of tradition, and science could still be seen as a mere intermediary to uncover it. Nature seemed to be held in reserve, transcendent, inexhaustible, distant enough. But where are we to classify the ozone hole story, or global warming or

[2] Appadurai (1996) talks about the concept of "modernity at large," which focuses on science, technological development, (neo)colonial dynamics, and the continuing dominance of statist identities and communities. In this project, modernity is treated as a global nexus of actual and perceptual forces that manifest within regional, national, and local contexts in various ways. As such, I am not interested in reifying modernity but rather exploring the "modernist" aspects and dynamics of geoengineering imaginaries.

[3] In response, Morton promotes an "ecology without nature" (2007). Although he attacks modernity head on, Morton's engagement with indigenous perspectives is slight, to put it mildly, and he relies primarily on (neo)colonial generalizations. For example, he writes, "Given that much ecocriticism and ecological literature is primitivist, it is ironic that indigenous societies often refer to nature as a shape-shifting trickster rather than as a firm basis" (2007, 21). Morton clearly misidentifies the locus of irony, and in failing to provide additional context, Morton's pithiness comes across as more than a mere oversight.

deforestation? (1993, 50).

In light of Latour's provocation, where are we to situate geoengineering? Or rather, how might one situate geoengineering in light of the Planktos incident? In lacking attentiveness toward historical and contemporary disproportions of power, George is emblematic of a certain, *all-too-familiar*, politics.

Fomenting this politics is a lack of headway on reducing current atmospheric carbon concentrations as well as a litany of uncertainties concerning an appropriate, which is also to say safe, warming target, and numerous studies now suggest that it might be too late to forestall a dramatic, if not catastrophic, increase in global average temperature by 2100 (Courvoisier et al. 2018; Frölicher et al. 2014). Consequently, debates over one and a half versus two degrees Celsius of global warming might be tantamount to choosing a shorter or longer song for the Titanic's infamous quartet to play, and entrepreneurs, such as George, are keen to squeeze some profit from whatever tune gets played, especially as some contend that the only achievable means to the one and a half to two degrees Celsius reduction target is via "negative emissions," which was included in scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) and rose to prominence during the 2015 Paris Agreement meetings (Anderson 2015; Courvoisier et al. 2018; Neslen 2015; UNFCCC 2015). The most recent IPCC report (2018) suggests with

“high confidence” that global warming is likely to reach one and a half degree Celsius between 2030 and 2052, so the proverbial clock is ticking.

Keeping pace, and perhaps playing into, increasing concerns over our collective climate futures, George has taken to calling himself *Greenfinger*—a tongue-in-cheek moniker that heightens his now *Bond-villain-esque* persona (George 2013). Dubbed the world's “first geo-vigilante," George has embraced the spectacle surrounding his exploits, and regardless of what one thinks about his intentions and methods, his sanguine proclivity for “public relations” is undeniable (Specter 2012). On his personal blog, which is aptly entitled “Greenfinger speaks,” George cheerily proclaims, "The work can be done by just 100 villages. To become one of the hundred follow this link, we just need 99 more" (George 2013). After a brief hiatus, George resurfaced in a 2018 interview with *The Ecologist*, a longstanding and widely read environmental affairs publication. Defending his project and focusing squarely on increased fishing yields, George wistfully opines, “The salmon were the best science result, right?” (Breeze 2018).

What becomes clear from George’s reflection is that he was, and perhaps remains, content in experimentation *upon* rather than experimentation *with* the collective continuance of the Haida, if not the global climate system. Channeling Machiavelli, the ends justify the means for George, which is to say that results (e.g. salmon) trumps any and all

ethico-political considerations. Given the increasingly bleak forecasts for climate change (IPCC 2018), the Planktos incident is potentially a sign of things to come and articulates the contours of the ongoing geoengineering debate. At one end of the spectrum, there are those, such as George, who champion research, if only to prove what might and might not work should the need arise to deploy such technologies. Proponents also highlight the need "to dilute the geo-clique," which refers to the insider community of geoengineering researchers (Keith 2013)—some of whom have commercial interests in climate engineering technologies (Keith et al. 2010; Parson and Keith 2013). At the other end, there are those who consider geoengineering a "Promethean dream" and believe research itself might be an obstacle to reducing emissions as even the promise of a down-the-road solution alleviates the pressure needed to enact change in the here and now (Hamilton 2013; Wetter and Zundel 2017). Across this spectrum, one finds a range of positionalities on research, implementation, and governance. As with any debate concerning the impact of other emerging technologies, the public, broadly defined, is struggling to find a meaningful way to engage, although a surge in media reporting on climate engineering as well as various efforts to foster exploratory exchanges on climate engineering, including scenarios, have taken center stage over the past decade (Asayama et al. 2017; Anshelm and Hanssen 2014; Banerjee et al. 2013; Bellamy and Lezaun 2017; Bodansky 2011; Burns 2011;

Burns et al. 2016; Cairns 2015; Cairns and Stirling 2014; Carr et al. 2013; Corner et al. 2012; Galaz 2012; Gannon and Hulme 2018; Jones 2018; Luokkanen et al. 2014; McLaren et al. 2016; Nicholson et al. 2013; Payne et al. 2015; Scheer and Renn 2014; Stilgoe et al. 2013; Sugiyama et al. 2017; Wong 2013). Indeed, scenarios on geoengineering have proliferated exponentially, although many, if not most, focus on technical aspects and technological conditions of possibility (Low 2017; Talberg et al. 2018).[4] Consequently, such scenarios "frame assumptions and create expectations" and, as some argue, implicitly promote "simplification and standardization" by normalizing radical potentialities (Talberg et al. 2018). Public, civic, and social engagement is a constant and consistent refrain within the ongoing geoengineering debate, but some have observed that such declarations are wholly and intentionally performative, which is also to say perfunctory (Bellamy and Lezaun 2017).

At its core, the ongoing geoengineering debate on research, implementation, and governance both reveals and conceals a politics that is deeply imbued with systemic uncertainties, global high stakes, and conflicts surrounding questions of value at a variety of scales.

[4] In a comprehensive review for geoengineering scenarios, researchers found, "[…] 102 publications comprising 87 peer-reviewed journal articles from 41 journals and 15 'gray' reports from 14 institutions. The most represented disciplines were meteorology and atmospheric sciences, environmental sciences, economics, ethics and engineering. The most represented journals were the *Journal of Geophysical Research: Atmospheres* (13), *Atmospheric Chemistry and Physics* (6), and *Environmental Research Letters* (6)" (Talberg et al. 2018, 1096).

Consequently, climate engineering has been deemed an inherently post-normal science (Bellamy et al. 2012; Bellamy et al. 2013; Chris 2016; Dilling and Hauser 2013; Rayner 2015; Talberg et al. 2018). In the remaining sections, I provide some conceptual clarity concerning my approach to geoengineering as envisaged through the lens of postnormal science. Next, I introduce heuristics from postnormal times (PNT), which is one of the critical political and futures frames I use to situate geoengineering and its politics. Then, I offer a practice-based reflection that interrogates the practice of scenarios, as well as the workshop space, culminating in a trajectory for a politics for geoengineering. Turning to games, I provide some definitional and theoretical clarity to contextualize how this project deploys play as a modality to enliven an alternative politics to the one embodied by George's experiment. Next, I introduce Causal Layered Analysis (CLA), which provides a methodological framework for analyzing the narrative frames underlying and driving geoengineered imaginaries. Finally, I conclude with a brief review and then sketch out the remaining chapters.

Postnormal science and geoengineered imaginaries

To say that Thomas Kuhn's *The Structure of Scientific Revolutions* (1962) had an impact on a range of discourses and disciplines would be a gross understatement. Indeed, few, if any, could have predicted that this tome would end up as the March 2015 selection on Mark Zuckerberg's

book club (Flood 2015). Regardless of what one makes of the Facebook CEO's selection, Kuhn's text forever changed a host of disciplines. Arguing that scientific processes are either revolutionary (creating a new paradigm) or normal (operating within or extending a current paradigm), Kuhn's work garnered acclaim and criticism for calling attention to the myriad dynamics surrounding means and modes of scientific inquiry. Breakthroughs are not the result of accumulated facts, as Kuhn puts it, but rather the result of challenging existent traditions. Normal Science, on the other hand, is the act of puzzle solving within a particular, and most importantly unchallenged, paradigm (Kuhn and Hacking 2012, 35). The paradigmatic shift from Newtonian to Quantum physics is perhaps one of the clearest examples of Kuhn's argument, and while many, if not most, are content to live within a world confined by Newton's theorems, it is impossible, if not unadvisable, to ignore the quantum realm. While Kuhn's "normal science" thesis drew immense critiques, including sharp condemnation from contemporaries such as Karl Popper, his dichotomy remains a key text in the history of science. Additionally, Kuhn's treatise induced the birth of post-normal science.

In 1991, Funtowicz and Ravetz published "A New Scientific Method for Global Environmental Issues" to "mark the passing of an age when the norm for effective scientific practice could be a process of puzzle-solving in ignorance of the wider methodological, societal, and ethical issues

raised by the activity and its results" (Funtowicz and Ravetz 1991, 138). For Funtowicz and Ravetz, global environmental challenges, namely climate change, require a democratic re-framing, or perhaps more accurately an *unframing*, of scientific practice—one that is acutely attenuated to non-expert audiences and stakeholders whose concerns, lifestyles, and values should be seen as more than externalities in relation to the possible impacts of scientific research and practice.[5] Post-normal science, then, was conceived as a conduit for making questions of value both central and explicit to research, and its originators note how their approach is best seen as a complementary tool for making previously bracketed externalities an internal and integral aspect of scientific practice (Funtowicz and Ravetz 1993). For Funtowicz and Ravetz, this is accomplished, in part, by introducing and entertaining "'extended facts,'" which can range from anecdotes to unofficial records (Funtowicz and Ravetz 1991, 150). At its core, an extended fact is a fundamentally human accounting of things, which is also to say that it is highly subjective and potentially based upon ideology rather than observation.[6]

[5] Writing about the affects of artistic practice, Guattari argues, "The work of art, for those who use it, is an activity of unframing, of rupturing sense, of baroque proliferation or extreme impoverishment, which leads to a recreation and reinvention of the subject itself" (Guattari 1995, 131). My usage of this concept centers on the rupturing of one's sense what is and is not normal, which is to say that I position *unframing* as precisely the aim of postnormal science and its intellectual inheritors, particularly postnormal times, which I introduce later in this chapter.

[6] Although the concept of extended facts foreshadows our all-too-postnormal mediascapes, Funtowicz and Ravetz did not forecast the rise and subsequent weaponization of social media, specifically how "fake news," as part meme and mythos,

In expanding the scope of scientific inquiry and bringing values, which is also to say non-expert desires, to the fore, Funtowicz and Ravetz contend that an extended peer community consisting of people with a vested interest should be engaged to democratize research inputs and outputs. Postnormal science contends that engagement with an extended peer community (hereafter EPC) can and might lead toward the integration and absorption of localized knowledge, which can shape areas of study and bring about alternative, including more collaborative and responsive, modes of research, which was the case surrounding the HIV/AIDS epidemic (Funtowicz and Ravetz 1993, 753). In the context of geoengineering, there are a number of issues that both compliment and complicate using postnormal science and EPC, in particular. Given the scale of geoengineering, the only sufficient EPC is, or ought to be, nothing short of the world itself—a rather large community for which no one has yet to devise an adequate means of equitable engagement. If the world cannot be engaged *en masse*, then participatory approaches and processes must be speculative and, perhaps most importantly, guided by an "ethics of expanded obligations," which is explicated fully in chapter three (Zylinska 2014, 17). Noting the ethical challenges at the heart of geoengineering, some researchers have put forward an analogy between

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has come to dominate "civic" discourse across numerous contexts (Tandoc et al. 2017). This receives greater attention in the next chapter.

biomedical experimentation and geoengineering proposals in seeking to establish norms, customs, and principles.[7] One of geoengineering's first "out-of-the-lab" experiments was cancelled due to concerns over governance and intellectual property, and the proverbial plug was pulled by the researchers themselves, if only to assuage the buzz surrounding their project (Stilgoe 2015). Aside from intentionally altering how the planet operates, the most recalcitrant challenges of geoengineering are decidedly human—how to communicate what it is, how it might (or might not) work, and how to forge spaces of critical and reflective engagement for a diverse array of participants, specifically within the nexus between public, science, and policy spheres. The core issues surround what is unknown and the degree of confidence in what is known—in sum, ignorance and uncertainty.

In the context of postnormal science, Funtowicz and Ravetz observe, "uncertainty and ignorance […] must be managed for the common good" (Funtowicz and Ravetz 1991, 146). From climate change deniers to chemtrail truthers, it ought to be painfully clear that any attempt to "manage" uncertainty and ignorance is a fool's errand—to say nothing about how one might go about establishing a "common good" related to the "stability" (actual, perceptual, and/or some combination of the two) of

[7] The complications of situating identity, both biologically and socio-culturally, makes for an interesting comparison—one that receives greater attention in chapter three (Morrow et al. 2013).

the global climate system[8] (Tingley and Wagner 2017). And yet, this is precisely what climate change seems to demand—thinking and acting at the interstices of the all-too-familiar and the truly unthinkable. Overcoming the "cognitive dissonance" that this quagmire fosters is an immense undertaking, to say the least (Festinger 2001). As Scranton puts it, climate change confronts us with nothing less than learning how to die through the process of realizing civilizational collapse, which, for many, signals a liberation from the tyranny of the past and present (2013; 2015). That Scranton makes absolutely no mention of indigenous communities, such as the Haida Nation, in his magnum opus is telling—particularly as to how various forms of privilege continues to haunt even the best intentions. This is especially concerning given the real locus of Scranton's argument: carbon-based capitalism[9] (Scranton 2015, 19). If anything, climate

[8] At the heart of this challenge one finds a range of epistemological approaches. Within the context of climate change, inductive approaches center on local impacts leading toward truly global shifts. On the other hand, deductive contentions position "global warming" as an unifying threat—one that can and will only be felt in highly-localized ways. Abductive reasoning, which was championed by Charles Sanders Pierce, emphasizes plausibility as a means of reducing uncertainty by focusing on the most likely possibility (Psillos 2004). Given the importance of plausibility in the practice of creating scenarios, this mode of inquiry is explored further in chapter three.

[9] Scranton's omission is quite surprising given that indigenous communities have been and continue to be at the forefront of contesting the exploitative practices inherent to carbon-driven capitalism. As Klein explains, "Space is opening up for a growing influence of Indigenous thought on new generations of activists, beginning, most significantly, with Mexico's Zapatista uprising in 1994, and continuing, as we will see, with the important leadership role that Indigenous land-rights movements are playing in pivotal anti-extraction struggles in North America, Latin America, Australia, and New Zealand. In part through these struggles, non-Indigenous progressive movements are being exposed to worldviews based on relationships of reciprocity and interconnection with the natural world that are the antithesis of extractivism. These movements have truly heard the message of climate change and are winning battles to keep significant amounts of carbon in the ground" (Klein 2014, 160).

change requires a resolute acceptance of uncertainty in all its horrific splendor driven by devout knowledge in the limits of our scientific, if not biological, capacities with a resolute attentiveness toward the historical and contemporary injustices underlying our collective crises, which is not equally shared. Climate change necessitates an ethico-political reckoning—one that geoengineering cannot abate or forestall. Indeed, what is most terrifying about geoengineering proposals is not just that they might "work," but rather the potentiality that such efforts would be wholly impotent or perhaps even foment further crises. Queue the Pandora's box references.

At present, the best "evidence" to support (or not support) geoengineering relies upon forecast models that often show complex and dynamic variability—from the potential disruption of the monsoon cycle (Burns 2011; Robock et al. 2008) to uncertain impacts on numerous life systems, such as oceanic food webs (Lin 2013). In short, there is simply no way to understand fully and completely the impacts and effects of large-scale climate engineering initiatives. Hence, some have championed the potential for a new models of governance, especially those emphasizing experimentation, born out of our dire need to mitigate climate change, although any kind or type of "techno-fix," especially one that might attempt to negate politics, has been widely disavowed

(Hamilton 2013; House of Commons Science and Technology Committee 2010; Scott 2012; Stilgoe 2015; Stilgoe 2016; Wapner and Elver 2016).

Given geoengineering's meteoric rise amongst scientists, researchers, and pundits, post-normal science has been used as a descriptor and conceptual lens from which to contextualize research (importance of uncertainty and extended facts), civic engagement (the concept of an extended peer community), and potential implementation of climate engineering initiatives (how values might shape such initiatives) (Bellamy et al. 2012; Bellamy et al. 2013; Chris 2016; Dilling and Hauser 2013; Rayner 2015). As one might expect, there has also been a proliferation of articles, research initiatives, meetings, and workshops aimed at fostering dialogue on geoengineering within and amongst civic participants, although, as previous noted, few presence ethico-political questions, concerns, and issues (Burns 2011; Cairns and Stirling 2014; Carr et al. 2013; Corner et al. 2012; Galaz 2012; Nicholson et al. 2013; Scheer and Renn 2014; Stilgoe et al. 2013).

In light of the shortcomings inherent to contemporary imaginings, some have called for "a novel class of scenarios […] that supports co-evolution of governance and technology, and co-production of knowledge as part of an iterative, actionable, and aspirational transition strategy" (Talberg et al. 2018, 1101). Articulating the need for "technologies of humility," Jasanoff argues for "[…] habits of thought [that] come to grips

with the ragged fringes of human understanding – the unknown, the uncertain, the ambiguous, and the uncontrollable" (2003, 227). In response to such calls and in anticipation of further escalation with regards to more than just rhetoric, this investigation deploy heuristics from postnormal times (PNT), which I introduce in the next section, to illuminate the ethico-political aspects of geoengineering. My specific interest in using this approach centers on how geoengineered imaginaries are conditioned, created, and communicated.

Operating as "structures of contingency," imaginaries shape the very conditions of possibility for geoengineered futures (Marcus 1995). At the exact intersection between the actual and perceptual, imaginaries are assemblages—shared beliefs, desires, fears, hopes, assumptions, and other percepts that manifest as and create norms within various social contexts (Jasanoff 2015). Functioning as spheres of common reference, imaginaries condition current trajectories and shape future(s) possibilities across and at a variety of scales.[10] As Jasanoff and Kim argue:

> Unlike master narratives, which are often extrapolated from past

[10] Echoing Funtowicz and Ravetz's call for an "Extended Peer Community," Jasanoff argues, "Living creatively with climate change will require re-linking larger scales of scientific representation with smaller scales of social meaning. How, at the levels of community, polity, space and time, will scientists' impersonal knowledge of the climate be synchronized with the mundane rhythms of lived lives and the specificities of human experience? (2010, 238). Curiously, postnormal science is absent from this piece, and this speaks to how epistemic imaginaries shape discursive parameters, even amongst those who critically analyze both.

> events and serve explanatory or justificatory purposes, imaginaries are instrumental and futuristic: they project visions of what is good, desirable, and worth attaining for a political community; they articulate feasible futures (2009, 123).

As Jasanoff observes, all imaginaries conceal, as well as reveal, a politics. Originally emphasizing statist imaginings, Jasanoff revisited the concept of "sociotechnical imaginaries" and outlined a broader framing—one that engaged more expressly with social and ethico-political dynamics. In updating sociotechnical imaginaries, Jasanoff argues that they are "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology" (Jasanoff 2015, 4). In creating a perceptual space for "good" climate engineering potentialities, geoengineered imaginaries are constitutive of possible (as well as preferable) futures. Indeed, it is the primary function of geoengineered imaginaries to condition "desirable" futures, and they gestate norms and framings that shape actualities, including the ongoing debate on research, implementation, and governance (e.g. George's organic gardening). As such, my interest lies both with imaginaries focused on geoengineering and imaginaries conditioned by geoengineering, and the latter points toward the specific challenges of confronting and contesting such assemblages.

Reflecting on how the discourse on climate change focuses primarily on the global scale, Jasanoff observes that the presencing of this

globalized fact contests and contradicts localized imaginings, which creates a rift where there is little or no "regard for the layered investments that societies have made in worlds as they wish them to be" (2010, 236). While some have championed geoengineering as a remedy for global climate change, it is not clear what effects such a potentiality might have on existent, including localized, imaginaries. As a conceptual orientation and rejoinder to Jasanoff's notion of sociotechnical imaginaries, geoengineered imaginaries is a means to complicate and contextualize the debate's core aspects. As such, my analysis of geoengineered imaginaries centers on three key areas of concern: centralization, corporatization, and commitment. Centralization centers on path dependencies within both technological and governance spheres. Corporatization focuses primarily on implementation but also gestures toward broader dynamics related to the processes that are driving climate change. Finally, commitment speaks to the multi-generational, and in some instances geologic, scale considerations inherent to climate engineering proposals.

While the concept of imaginaries has been used to explore a range of "technoscientific" and "sociotechnical" issues, no one has yet made an explicit link between this conceptual frame and postnormal times (PNT), which builds on the core assumptions of postnormal science (Marcus

1995; Jasanoff and Kim 2009).[11] In the next section, I introduce PNT and setup its emergence as a movement within futures studies making an explicit link with how this approach encounters imaginaries. I then situate how postnormal heuristics can and might be used to enliven a politics for geoengineering.

Let a thousand jellyfish bloom

In late September 2013, unit three at the Oskarshamn nuclear power plant in Sweden was forced to shut down. As the world's biggest boiling-water reactor and the largest nuclear facility in the Nordic region, Oskarshamn's sudden closure was not without notice. While workers at Oskarshamn were quick to dispel the possibility of a meltdown on the Baltic, the cause of the stoppage left some scratching their heads: a massive bloom of moon jellyfish clogged the site's intake piping, which provides cool water for the 1,400 megawatt unit (Guilford 2013). While the Oskarshamn incident received significant media attention, this is not the first time that jellyfish, which are actually not fish but rather invertebrates, impacted unit three's operations.

In 2005, Oskarshamn, which provides roughly 10% of Sweden's power, was forced to power down for the same reason. This phenomenon has not been limited to Oskarshamn, as massive blooms have created

[11] From January 2014 to January 2018, I served as Deputy Director at CPPFS, which entailed further development of PNT. In the next section, I complicate my own positionality in relation to using this approach, which I see as a movement within futures.

similar shutdowns at nuclear facilities in the United States, Israel, Scotland, and Japan (Merchant 2013). In 1999, the meddlesome invertebrates led to the closure of the Sual coal-fired power plant in Luzon, Philippines. The brief blackout left 40 million without power and incited "fears that a long-rumored military coup d'état was underway" (Tucker, 2010). Although the power was only off for about ten-minutes, President Estrada issued a statement ensuring the public that the blackout was "not part of an attempt to destabilise the government" (Ramos 1999). And, no political justifications were provided by any of the involved jellyfish. President Estrada, however, failed to mention the actual cause of the disruption, which one can only imagine that some might have found more terrifying than an impromptu coup d'état. In response to such incidents, scientists from the Korea Advanced Institute of Science and Technology (KAIST) designed the "Jellyfish Elimination Robotic Swarm" or JEROS. These autonomous jellyfish terminators are programmed to seek and destroy coastal blooms, which in Korea alone impact local fisheries an estimated $300 million a year (Gray 2013). When jellyfish are killed, however, they release eggs, which, as one might expect, leads to more jellyfish. KAIST has yet to release any information about the available settings on its proposed sea-based drone/blender solution.

While KAIST's remedy is perhaps the most imaginative, it is certainly not the only one. Scientists in the United Kingdom are working to

create an early warning tool to counteract potential blooms on the North Sea (University of Bristol 2016). In January 2018, the GoJelly project will launch. This EU-funded initiative runs for four years and aims to use jellyfish mucus to produce micro-plastics (Norwegian University of Science and Technology 2017). While there is an increasing sense that jellyfish blooms are rapidly becoming a significant issue, there is actually scant data to support such a claim (Lamb 2017). Part of the challenge in backing up the "stung" scenario has much to do with the difficulties in studying jellyfish and blooms (Condon et al. 2014; Gershwin 2013; Graham et al. 2014).

A lack of evidence, however, has not dissuaded some from seeing the convergence of a variety of trends and forecasting likely scenarios. Overfishing leading to the loss of natural predators coupled with increasing oceanic and sea temperatures points toward the invertebrates enjoying a preferred future. As Gershwin observes, the full realization of these trends, which would result in a veritable jellyfish takeover, are "socially unfathomable, and essentially apocalyptic" (Gershwin 2013). Some have even gone so far as to suggest that a "new normal" might be one in which jellyfish are "the only seafood left" (Pauly et al. 2016, 10). While some might find such a prospect anything but normal, others, especially in places where jellyfish are already on the menu, might take issue with such a claim. As such, it is imperative to ask: normal for whom and in what

context? As a framing for critical and reflective analysis, the "new normal" falls into the modernist trap and, perhaps most egregiously, ignores the particularities of context. As a means of going beyond the new normal, Sardar introduces postnormal times (PNT) as an extension of post-normal science, which emphasizes uncertainty, values, and the need for new forms of engagement (Sardar 2010b).

In "Welcome to Postnormal Times," Sardar articulates an array of forces that complicate how futures are imagined and how futurists practice. This point is essential in understanding the origins of PNT as a movement centered on articulating the many and varied tensions of our contemporary age in order to fortify our creative capacities for imagining but also facilitating futures explorations (Kuzmanovic and Gaffney 2016). Hence, "postnormal" distinguishes itself from the concept of a "new normal" by focusing on both the what and how of futures as a practice with a particular emphasis on the "subservience of imagination to orthodoxy" (Sardar 2010b, 443).[12] Orthodoxy and its norms do not appear out of thin air, and it is precisely how various entities establish, promote, and sustain norms, which function as processes and mechanisms of control, that PNT

[12] Sardar's key example is the 2008 financial crisis, and he asserts that the fundamental conditions and practices the led to this event were not altered in any meaningful way, which is to say that there is a certain degree of social/institutional amnesia that has become normalized, if not institutionalized within the financial system. Hence, his argument as to why futures ought to promote and utilize a postnormal lens.

aims to disturb.[13] In PNT, one challenges orthodoxy via a triumvirate of forces that, according to Sardar, must be understood in order to "negotiate a viable way forward" (Sardar 2010a, 436). These forces are complexity, chaos, and contradictions (3C's).[14]

Amongst futures researchers and practitioners, complexity is often a synonym, if not placeholder, for systems thinking approaches and methods. It is important to note that Sardar employs a political lens in how he frames complexity, and this thread, which runs throughout his oeuvre, centers on calling into question the colonizing forces that disable possibilities for what lies ahead. In PNT, complexity has everything to do with scale—challenges that are large, interconnected, and seemingly unresolvable. One might be hard-pressed to devise a better description for global warming—the problem for which some think geoengineering is a, if not the, solution. Such magical thinking—specifically relying upon a techno-fix—often ignores the potentiality for chaos, which is framed as systemic overload and/or breakdown.[15]

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[13] Given this trajectory, PNT very much confronts groupthink, which points toward how errors in decision-making arise by focusing on consensus—typically between the public and policy-makers. As an artifact of norms, groupthink is well within the remit of PNT, although this concept is not directly employed or referenced (Janis 1982). This represents a clear oversight, and I am thankful to Dr. Dick Chadwick for this insight.

[14] That Sardar calls them forces is telling, and this suggests that they are not theoretical constructs but rather actual and perceptual drivers of continuity and change. This distinction becomes critical in chapter three.

[15] Etymologically, chaos has Greek roots and refers to a void or chasm. In physics, chaos centers on unpredictable conditions and/or behaviors within a complex system. In his 2010 treatise, Sardar does not provide a clear or concise definition or contextualized usage of this term. He does, however, make an explicit linkage to chaos theory, which

Mapping the radical potentialities of our postnormal age, Sardar invokes chaos to illuminate technological acceleration, specifically related to the rise of social networks and algorithmic advancements that have produced substantive shifts in a variety of contexts. Within Sardar's initial framework, chaos is often, but not always, fomented by contradictions. For Sardar, "exponential acceleration has now become the norm" (Sardar 2010b, 439). Initially, the examples used to make this justification are entirely technological, but Sardar turns to explicate a litany of socio-economic inequities as a means of pointing toward the contradictions underlying such claims. For Sardar, there are two distinct categories of contradictions.

Problematizing the assumption that the long arc of progress, and the radical changes underlying it, are upending life as we know it, Sardar points out how, for many, life continues to be the same as it has been for centuries, which is to say plagued by a litany of colonial and neocolonial forces and mechanisms. The first category of contradictions have much to do with neoliberalism and the disproportionate ways with which wealth is accumulated and shared—in short, the underlying conditions driving the global climate system toward calamity. Indeed, Sardar explicitly states,

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originates from mathematics and centers on the sensitivity of systems to small changes. He writes, "But it is rather unusual to see civilisations, whole societies or indeed the entire inhabitants of the globe, behaving according to the dictates of chaos theory" (2010b, 437).

"the postnormal world is a world of disproportion" (2010b, 444). The first category of contradiction, then, centers on the contention that for some to win there are those who must lose. The second category of contradictions focuses more on the perceptual aspects of life in our all-too-modern world, specifically the epistemological challenges facing those within digital technospheres. Sardar contends that while we have access to greater amounts of information, we do not seem to have the capacity to organize, analyze, and synthesize this information, which is to say that we are illiterate in processing this information. Climate change deniers, some of whom rather hypocritically support geoengineering, embody this formulation.

In PNT, the gravity of the 3C's rests upon an assertion that "much of what we have taken as normal, conventional and orthodox just does not work anymore" (Sardar 2010b, 436). It is in this sense that PNT is both descriptive and prescriptive, although it is not without its critics. What has been and is "normal" has always and ever only worked for some and not all, and while Sardar, like many others before him, aims to problematize normalcy, this line of thought remains undeveloped in Sardar's 2010 paper, although later works pick up on this thread (Sardar 2015a; Sardar and Sweeney 2016). Furthering the above contention, Kapoor argues that PNT embodies the restlessness of "the West," which is losing its foothold as arbiter of *the* future (Kapoor 2011).

As with any theoretical construct, PNT's accessibility, if not efficacy, has intended and unintended audiences. In chapter three, I situate PNT more fully within the context of futures studies. Ultimately, my invocation of postnormal heuristics rests on the contention that geoengineering, and its surrounding debate, has much to do with the failures, both actual and perceptual, of "normal" processes of remediating climate change. If geoengineering is intended as a protraction of the systems and processes that produced global warming, then it feeds off of socio-economic dogma surrounding efficiency, progress, modernization, management, and control—in short, modernist sensibilities. As artifacts of an all-too-modern form of "progress," the complexities of the global climate system, contradictions underlying global warming, and the potentiality for further ecological chaos position geoengineering within the purview of PNT. Given this resonance, I am interested in seeing how PNT might act as a conduit for confronting, contesting, and complicating geoengineered imaginaries and, perhaps most importantly, the futures emerging from them. Specifically, I am interested in applying Sardar's concept of an "ethical imagination," which serves as a means of going beyond modernist trappings and postmodern relativism (Sardar 2010b, 444). As such, I limit my engagement with PNT to a series of concepts designed to stimulate critical inquiry on emerging issues, such as geoengineering.

As a means of making the core aspects of PNT more relatable and,

perhaps most importantly, digestible as a methodological construct, Sardar and Sweeney (2016) introduced the Menagerie of Postnormal Potentialities (Menagerie), which combines black elephants, black swans, and black jellyfish—some of which are widely used concepts in the broader futures space. The Menagerie was designed to reframe, or unframe, one of the central practices and processes of futures—emerging issues analysis.[16] Horizon or environmental scanning is widely considered to be one of the foundational methods of futures studies (Aguilar 1967; Morrison and Mecca 1989; Petersen 1997; Bell 2003; Voros 2003; Dator 2018). In addition to identifying trends, scanning involves looking for wild cards, weak signals, and/or emerging issues.[17] As things, events, and phenomena that might (or might not) become trends, or perhaps disrupt (or mutate) them, emerging issues are often analyzed using categorical

[16] In question form, the Menagerie asks, what are most people missing or not seeing? (contradictions); what do people think would never happen? (complexity); and, what can or might lead to chaos? (chaos). This schema would not have been possible without incisive and insightful contributions from Dr. Wendy Schultz, who has been a generous supporter and thoughtful collaborator over the years.

[17] The concept of "wildcards" has been repeatedly problematized, primarily as it makes the implicit case for "non-wild" cards (Dator, Sweeney, & Yee 2015; Sardar & Sweeney 2016). Wildcards are employed herein only as a reminder of its continued, if not predominant, usage within the broader futures field, and rather than using this term, Markley (2011) has resorted to calling such phenomena "surprises." In PNT theory, all "issues" are presumed to have disruptive potentiality, and this perceptual shift is core to the Menagerie as a framework for engaging with emerging issues.

frameworks—the most popular of which is STEEP.[18] As a practice, emerging issues analysis (EIA) stems from the seminal work of Graham T.T. Molitor who pioneered using the "S-curve" model for anticipating how trends change over time (1977). In short, Molitor's framework focuses on change over time and centers on the "take off point," which is the moment at which the greatest amount of change occurs in the shortest amount of time. Take the iPhone. Released in 2007, it completely transformed the mobile phone market, and while other platforms and handsets have become more popular, it remains, for many, the standard by which all others are measured. Here, the emerging issue was not smartphone, which had been around for some time, but rather a certain user design and interface—one that has come to define the space as a whole.

In contrast to trends analysis, EIA looks beyond the obvious and instead sets out to discover "tiny bits of evidence that might or might not begin to bud as trends and blossom into full-blown problem/opportunities in the futures" (Dator et al. 2015, 139). As with trends analysis, impacts and effects are modeled using a range of frameworks, including STEEP. Identifying and analyzing emerging issues always occurs within and from

[18] Social, Technological, Economic, Environmental, and Political are areas of concern where one looks for scan "hits." Again, rather than identify trends via data, emerging issues analysis is far more subjective and qualitative, although much of the literature does not emphasize the importance of positionality and trans-subjective perspectives in how such issues are identified, analyzed, and communicated. In recent decades, STEEP's influence, although still substantial, has given way to other approaches, including: STEEPV, which includes values (Bezold et al. 2003) and PESTLE, which adds legal as a category (Morrison and Weeks 2017).

a particular context, but the degree to which this remains explicit has as much to do with the person performing the analysis as the process by which one analyzes, which is to say that reflexivity and positionality are essential, although often implicit, aspects of this practice.[19] While perception is key to scanning, the necessity of divergent perspectives sets the Menagerie apart. Individually, black elephants, black swans, and black jellyfish offer a means to examine phenomena and establish consensus—as to whether a particular emerging issue is a black swan versus a black elephant, etc. As an ensemble, however, the Menagerie attempts to enact a new game—one premised on dissent. The ultimate aim of this approach is not to frame an emerging issue from a single perspective but rather to enliven an unframing of subject positions from which to investigate, interrogate, and imagine an emerging issue's postnormal potentiality. Geoengineering meets all the characteristics of an emerging issue, and although small-scale efforts have been attempted, it lacks the notoriety typically indicative of a trend, although context and perspective figure prominently in such determinations. With complex emerging issues such as geoengineering, which is truly global in scope

[19] Emphasizing the importance of perception in scanning processes, Voros contends, "It is a truism that all of our environmental scanning is undertaken through perceptual filters. These filters are mostly not conscious, but rather act as pre-conscious conditioners of what we see. Any framework which helps to expand the range of our perceptions may thus help us to become more attuned to more of the world out there. […] It is also necessary for scanners to become aware not only of how they perceive the world, but also of what types of filtering are likely in their own minds" (Voros 2003b, 38).

and scale, dissent might be the only means of un-framing the politics underlying and driving its decidedly modernist imaginaries.

While postnormal science champions the extended peer community, whose locus is the inclusion of "extended facts," the Menagerie was designed to problematize such distinctions (inside versus outside) and, instead, emphasize divergent positionalities and dissent in modeling impacts and effects. From what subject positions has this issue not been seen? Whose voices have not been heard? Why an elephant and not a swan? In proliferating a divergence of sense, the Menagerie resonates with Rancière's formulation of dissensus as a political construct that "is not a discussion between speaking people who would confront their interests and values. It is a conflict about who speaks and who does not speak, about what has to be heard as the voice of pain and what has to be heard as an argument on justice" (Bowman and Stamp 2011, 2). As such, I deploy the Menagerie to enliven a politics for geoengineering and, perhaps most importantly, to stage provocations whereby the unseen, unheard, and unspoken are invoked. In this sense, the Menagerie can be utilized to foster a politics that goes beyond civic engagement and enhanced public participation—it necessitates a confrontation with the decidedly postnormal dynamics underlying geoengineered futures and the imaginaries underlying them.

In the next section, I begin to sketch out a methodological pathway

for a politics for geoengineering, which was born as much from my time spent as a graduate researcher at the Hawai‘i Research Center for Futures Studies as it was from my work as a professional futurist. As such, I employ a practice-based research lens to invoke and complicate my own positionality.

How I learned to stop worrying and love the workshop

The omission of all that is personal makes the scientific 'self' into a fiction lacking any equivalent in reality.
-Sven Lindqvist (1997)

In 2011, I participated in co-designing my first alternative futures workshop: *Hawai‘i 2060: Visioning Hawai‘i's Adaptation to Climate Change* (Hawai‘i Research Center for Futures Studies 2011). Working as a researcher, designer, and facilitator on this project was formative in my professional development, especially as this was my first real opportunity to cut my teeth, so to speak, as a futurist. That the event was meant to follow-up on the landmark Hawai‘i 2050 added to the weight of my involvement. Hawai‘i 2050 featured a set of experiential alternative futures, which were spearheaded by Stuart Candy and Jake Dunagan—two “Mānoa School” alumni whose depth and range of work served as a sort of “gold standard” for graduate students affiliated with HRCFS, which is where much of their previous work decorated the walls (Hawai‘i Research Center for Futures Studies 2006).

As with its precursor, Hawai‘i 2060 featured experiential

engagements with four alternative futures (Dator 2009). Given the success of Hawai‘i 2050, I was keen to learn about how one might best craft immersive experiences—the focus of Candy's dissertation, which was an invaluable resource while working on Hawai‘i 2060. Of all the insights contained therein, one has endured. Reflecting on the Hawai‘i 2050 scenarios, Candy observes how the future found its way back into the present circa 2010. Reflecting on the *Citizens United* decision, which is widely seen as giving corporations undue influence in the American electoral system, and the somewhat surprising entry of a public relations firm into a Maryland Congressional race that same year, Candy opines, "[…] in building scenarios, it can be difficult to be outlandish enough to encompass the kind of surprising changes we ought to expect" (Candy 2010, 97). This intimation, which was actually just a mere footnote in his dissertation, has always stuck with me and, perhaps unsurprisingly, shaped my own sense as to the limits and constraints of scenarios—the proverbial butter on a professional futurist's bread.

Candy's specific usage of "scenarios" in the above passage underlies an important, although often implicit, distinction between "scenarios" and "alternative futures," which are not synonymous

concepts.[20] For this project, both "alternative futures" and "scenarios" are envisaged as tools for navigating a broader "possibility-space," which centers on explorations "independently of initial views regarding probability and desirability" (Miller 2006). Resonating with Candy's emphasis on surprise, Miller's "possibility-space" construct offers a bearing for how the future(s) gets constructed and, perhaps most importantly, how intentionally designed spaces of surprise, and play, might serve as both an affective, and by extension effective, mode of engagement. A look at the origins of the futures workshop helps to put this trajectory into context.

Jungk and Norbert's work in crafting a formulaic structure for workshops was instrumental in the development of futures studies (1987).[21] With the arrival of their three-part formula, an explicit futures remedy for how to "fill a gap in existing democratic systems" was set made

[20] Recounting an exchange with Dator on this distinction, Inayatullah relays that the latter connotes a "far broader concept, being based on historical archetypes, deep patterns that reoccur through time" (2009, 78). The difference, then, lays not so much in usage but rather regarding outcome. In his overview of the "Mānoa School" approach, which uses "generic" futures and a set of driving forces as part of a research-driven process, Dator stresses the importance of visioning a preferred future as the culmination of an alternative futures exercise, which is to say that the intended aim of using this method is to confront fully and completely what one does and does not want (2009; 2014). It is not uncommon to find references to "alternative futures scenarios" across futures, and this underlies the points of overlap between the two. In the context of the "Mānoa School" method, which uses four archetypes (growth, disciplined, transform, and new beginnings), it is common practice to speak of "a growth scenario," which suggests that the specificity of the content is also what distinguishes the two.

[21] Around the same time as Jungk and Norbert's framework emerged, Warren Ziegler published "Designing and facilitating projects and workshops in futures-invention: A guidebook" (1987). Outlining a five-step process, Ziegler appears to have worked primarily with the private sector on envisioning preferred futures, although he collaborated with Elise Boulding, who also created her own visioning process, on peaceful futures (Hicks 2004). I am thankful to Dr. Sohail Inayatullah for drawing my attention to Ziegler.

public (Dator 1993, 1). Explicating a step-by-step approach for staging a futures workshop, Jungk and Norbert outline a method that moves participants from critique to fantasy to implementation. At the literal center of their design, Jungk and Norbert give the fantasy stage the most thorough treatment as it involves the most explicit "futures" content. They explain, "In the fantasy phase, the worlds of our desire gradually emerge from flashes of insight as we form and test associations of images and ideas" (Jungk and Norbert 1987, 61). How exactly these flashes of insight emerge and the means by which the worlds of our desires are brought forward through practice remains somewhat esoteric within the text. I never read the original text in its entirety prior to the Hawai'i 2060 event, but during the planning stages of that event, a critical review by Dator served as a guide—particularly the contention that "we cannot follow Jungk's future workshops method exactly"[22] (Dator 1993, 3).

In "From Future Workshops to Envisioning Alternative Futures," Dator provides his justification as to why one cannot and should not make the leap directly from critique to imagination or, more accurately, an immediate transition from analyzing the past to articulating one's preferred future. In a passage worth quoting at length, he observes:

I think it is a serious mistake to ask people to engage in any kind of

[22] Ostensibly, Dator's "we" refers broadly to the "Mānoa School," which is a community of practice as much as a methodological framework for analyzing and creating alternative futures (Jones 1992; Dator 2009).

> a preferred futures envisioning exercise until they have been challenged to examine their own various ideas about [the] future first. This is where the futurist plays her most important role: not of course in predicting the future and telling the enthralled throng what the future Will Be, but rather in structuring the situation so that the participants themselves are led to express, clarify, and modify their own individual and consensual images of the future. One part of that role is for the futurist to present in some dramatic, engaging way some of the elements (forces, components) in the past and present, which might most strongly influence the future. […] People need to find a way directly to experience this feature of the future (Dator 1993, 4).

Directly experiencing the tensions between continuity versus change, normalcy versus novelty, everyday versus weird, and present versus future is the proverbial "sweet spot" for a futures workshop. And yet, such processes rely as much on the assumptions of the designers as the willingness of the participants, which is to say that there are significant ethico-political issues centering on privilege, power, and positionality inherent to the design and delivery of futures workshops.[23]

While I cannot speak to the Hawai'i 2050 event, it is certainly the case that predominantly non-locals and non-Native Hawaiians crafted the

[23] Capturing this sentiment succinctly, Slaughter argues that critical futures studies proceeds from the contention that there is "*no neutral standpoint outside history upon which the futurist can stand*" (Slaughter 1999, 220). I could not agree more with this assessment, but I also do not locate this work within the specific framing of "critical futures studies," if only to suggest that futures (as a shorthand for futures studies) is fundamentally a critical ethico-political enterprise. Noting how such perspectives were in play well before Slaughter's reification, Ramos reflects, "While Slaughter was the first to articulate an outline for critical futures, there were already many at work in varying capacities on this project. Ashis Nandy, Zia Sardar, Johan Galtung and the Manoa School of Futures in Hawaii, to name a few, were all in the process of developing their varied aspects and approaches to critical futures" (Ramos et al. 2003, 19). In drawing heavily on the work of Nandy, Sardar, and many futurists from the Mānoa School, it would be improper, if not irresponsible, to note how this project resonates with the core tenets of critical futures studies.

Hawai'i 2060 event. Furthermore, the Hawai'i 2060 event could, and certainly would, have profited immensely from additional Native Hawaiian participation, which speaks to the challenges but also limits in staging large-scale, in-person workshops.[24] As the specificity of the context(s), participants, and themes are integral to designing and delivering such experiences, there cannot (and should not) be a single means by which to design such gatherings. Reflecting as a practitioner, the lessons learned from such events were instrumental in my journey to explore alternative modes and means of engagement. Considerations about design are always conditioned by "practical" realities, which are often outside the control of the design team and/or facilitators, and my early experiences in the field led me to question the sometimes oblique and artificial nature of the workshop space. In many instances, participants are invited and asked to step away from their normal routine or daily circumstances to "work" on a particular subject or topic for a few hours or days at a time alongside colleagues, peers, neighbors, and/or complete strangers. This usually centers on the completion of a series of exercises, which are typically organized around a series of questions and queries.

In Dator's alternative futures workshops, participants are typically put into small groups and receive textual scenarios, which forms the basis

[24] For the Hawai'i 2060 event, participants from different islands were brought over, and while a team from HRCFS (myself included) led the design and delivery of the alternative futures portion of the project, decisions concerning who would and would not participate were not part of our mandate.

for a discussion on their "life and work if they were to find themselves in some different kinds of futures" (Dator 1993, 4). How might one best position participants to "find themselves" in alternative futures? How can one ensure that participants have an equal opportunity to express themselves? How can one balance individual versus group-level outputs and outcomes? Are such practices and processes implicitly geared toward consensus? During the Hawai'i 2060 project, participants were immersed within two contrasting alternative futures scenarios and given some prompts to foster a character identity. It was during this portion of the event that I first considered the limits of pre-created scenario experiences.[25] Concerns over the efficacy of scenarios are not just a perennial issue that each generation of practitioners must confront but suggest a reflexive undercurrent inherent to futures as a practice, although some have made critical swipes at the workshop space and pre-created

[25] Indeed, as one of the lead designers for how the scenarios were rendered in experiential form, I did much to shape the look and feel of these exercises. Although I problematize the scenarios aspect of the Hawai'i 2060 exercise, the event did result in the amendment of the State's planning statutes and the passage of legislation, Act 286 - HRS §226-1 was signed into law on July 9, 2012. Specifically, the amended statutes make explicit reference to "future generations" (State of Hawai'i 2018).

scenarios in particular.[26] Part of the challenge in using scenarios centers on the fact that futurists, even if unwittingly, enact a politics, which is grounded upon the foundational assertion that the future is fundamentally plural (i.e. *futures*). As Inayatullah argues, futures does aim to "disturb present power relations through challenging our categories and evoking other places or scenarios of the future. […] This allows spaces of reality to loosen and new possibilities, ideas, and structures to emerge" (Inayatullah 2004, 7). How might one best loosen the reality of others? Are some approaches better suited to fomenting a possibility-space?

It was with the above in mind that I agreed to join Dator and Aubrey Yee, a fellow graduate student and researcher at HRCFS, to respond to an invited grant call on how technology changes the balance of power within society. In the lead up to submitting our proposal, I made what, in hindsight, was a rather hasty suggestion: we should create a game to carry out our research. Although I had no formal training in game design, years spent in front of a Nintendo Entertainment System along with a

[26] As part of a symposium on scenarios in the *Journal of Futures Studies*, Molitor offers a critical take on scenario planning and argues that scenarios exercises do little to promote reflective distance from the present and one's perceptions of it. He opines, "As a practitioner and teacher of forecasting engaged for some 50 years in the futures field, I can't recall any personal experience with scenario exercises that was worth the time and effort spent. Among major companies, business groups, and government offices I never saw scenarios make any major contribution or breakthrough. […] Such efforts may amount to little more than a time-consuming "parlor game" in my estimation" (2009, 81). Although Molitor invokes the notion of a "game" as a slight against scenarios, I play with the games metaphor in later chapters.

passion for Settlers of Catan[27] inspired me to take on a leading role for this area of our research.[28] It would be misleading not to recognize the boom in futures-driven games that started to pick up steam just a few years before.[29] Thus began my odyssey into uncovering and discovering how the modality of play—enacted via games—might transform scenarios as a practice and disrupt the workshop space. Indeed, it was games that helped me to stop worrying and love the workshop.[30] In the next section, I setup my turn to serious games, explore resonances between this approach and futures, and setup play as a modality for experimentation.

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[27] Klaus Teuber's award-winning game altered "dramatically the perception of German games within the hobby and mark the coming-of-age of European game design" (Woods 2012, p. 71). I was heavily influenced by the game's utilization of hex-shaped cards.

[28] There should be no doubt that my pursuit of gaming was supported in large part by my professional and personal relationship with Dr. Aaron B. Rosa, who has served as a co-conspirator in every sense of the word. One outcome of our collaboration was recounted in "Mutative Media: Communication Technologies and Power Relations in the Past, Present, and Futures," which was given the "Most Significant Work Award - Methods Category" by the Association of Professional Futurists in 2015. Another colleague and friend, Dr. Zhan Li, was instrumental in making connections with game researchers and designers at the University of Southern California, who were gracious with their knowledge and time.

[29] Specifically, the Institute for the Future's *Superstruct*, which attracted thousands of players, is seen as a watershed moment for futures games (Pescovitz 2008). One of my first engagements at HRCFS actually involved hanging posters for *Coral Cross*, which was an alternate-reality game designed by Candy and Dunagan for the Hawai'i Department of Health with support from the Center for Disease Control (Pescovitz 2009). Unfortunately, the latter was interrupted by reality as a real-life swine flu outbreak necessitated that play be altered. It is certainly the case that the future collides with the present in ways that even futurists cannot divine.

[30] Referencing Stanley Kubrick's "Dr. Strangelove *or: How I Learned to Stop Worrying and Love the Bomb* (1964) is a perhaps not so subtle way of highlighting the role of Herman Kahn, a Cold War-era futurist who worked at the RAND Corporation for decades and has been given credit for introducing the term "scenario" into the futures lexicon (Candy 2010; Chermack et al. 2001).

Why serious games?

"You can discover more about a person in an hour of play than in a year of conversation." – (probably not) Plato

Although the above quote is often attributed to the canonical Greek thinker, its provenance has been called into question (D'Angour 2013; Yount 2018).[31] While Plato's dialogues exhibit varying degrees of playfulness, the notion of "law-abiding play" is central to his theorization of society in the *Republic* (Ardley 1967, 234). According to Plato, one way to engineer a stable society would be to have all children play the same game with standardized rules over and over again (D'Angour 2013). Concerning big kids (i.e. adults), Plato appears to have thought that play was an "unworthy activity," although intellectual sparring—ostensibly in a dialogue with Socrates—was a worthy pursuit (D'Angour 2013, 293). For Plato, play was merely functional—a tool only to achieve a very specific end. Based on this logic, it is unclear if he enjoyed playing games or spent very much time around children.

For even the most precocious child, tic-tac-toe can be engrossing, at least for a little while. Eventually, the game becomes routine, and more complex modalities are sought after. For chess prodigies, however, a proper match is an intense contest of strategy where reputations are won and lost. Every move is a calculated strike born from intense study. It

[31] This (mis)attribution comes from McGinnis (1987).

perhaps goes without saying, but it is worth making explicit: games have been played for a variety of reasons toward a veritable cornucopia of ends since time immemorial. Some play only to win. Others play to enjoy the company of others, although there are perhaps just as many who prefer to play alone. While spontaneous acts of play, which are not limited to our species, are integral to our sense of the world and our place in it, my specific interest in games lies in how they have been and might be used toward more "serious" ends (Abt 1970; Pellis and Pellis 2011; Whitebread et al. 2017).

Within the social sciences, and political science in particular, games, simulations, and modeling approaches have been used and utilized for decades, in part due to advancements in data capture and analysis but also specifically to thwart crisis, particularly overpopulation and the threat of nuclear armageddon (Djaouti et al. 2011; Lasswell 1977; Lopez 1978; Bloomfield 1986; Chadwick 2000).[32] In 1970, Abt introduced the concept of a "serious game," which signals an attempt to define games with "an explicit and carefully thought-out educational purpose" that, perhaps most importantly, are "not intended to be played primarily for amusement" (Abt 1970). At the time of his book's release, Abt's work was

[32] Notable amongst such approaches is Buckminster Fuller's *World Game* (1969), which simulates conditions using real-world data to emphasize the necessity for collaboration and global awareness. Chadwick chronicles the rise of modeling tools and methods during the 60's and 70's and notes the "lack of formal study of global modeling in an academic environment," which signals a major challenge in reviewing the efficacy and impact of such approaches (2000, 68).

closely aligned with war games and red-team simulations used by military, intelligence, and security agencies during the height of the Cold War era. It is still the case that these institutions—in the U.S. and elsewhere—use games, simulations, and modeling approaches toward a variety of ends. Since Abt's introduction of the concept, however, what passes or counts as a serious game[33] has expanded to include a host of systems, platforms, and tools that leverage a range of dynamics to foster creativity and learning (Bergeron 2006; Morris et al. 2013). That games have found their way into futures should not come as a surprise, especially given the field's reliance upon the possibility-space. From overlaying gaming dynamics, such as role-play, onto existing methods to the creation of boutique platforms and systems, futurists have been using games for decades, although the past two decades has seen a veritable explosion of experiential approaches (Bok and Ruve 2007; Bontoux et al. 2014; Dannenberg and Fischer 2017; Dator et al. 2015; Hayward and Candy 2017; Hayward and Voros 2004; Heinonen et al. 2015; Inayatullah 2013; Milojević 2017).

[33] Some argue that the notion of a "serious game" is an oxymoron as such approaches have been essential aspects of human experience and learning for millennia (Djaouti et al. 2011). It is also important to distinguish between "game theory," which derives from mathematics and centers on how choices are made in competitive environments, and theories on games and gaming, which interrogate approaches to play—serious and otherwise.

In November 2016, Tamkang University hosted a symposium entitled: *Gaming the Future(s): Pedagogies for Emergent Futures*.[34] Bringing together futurists from around the world to explore how games can and might advance and be advanced within the field, specifically how such approaches, method, practices, and tools blend "thinking-playing-contextualising-experimenting-reflecting-sensemaking-sharing" (Milojević 2017, 3). Setting the tone for the event, Dator's keynote address gave presence toward the efficacy of playful modalities within both political science and futures. Articulating succinctly how games provides a means to experiment *with* alternatives and potentialities, he observed:

> Games are the closest we can come to actually doing politics repeatedly, and to pre-experiencing alternative futures so as to have a wider understanding of what might be viable preferred futures. That is to say, games are to the social sciences what laboratory experiments are to the natural sciences (Dator 2017, 77-78).

Emphasizing the ways with which games can be used for reflective learning, Dator's comments highlight how games operate as experiments. As with experiments carried out in a laboratory, definitional clarity regarding variables is essential. In the next section, I situate my approach to games using the lens of Carse's finite and infinite typologies.

At their most basic level, games are structures where one must confront and ultimately overcome obstacles or challenges through a set of

[34] A special issue of the *Journal of Futures Studies* (Vol. 22, No. 2, December 2017) was produced based on contributions to this event, and many, if not most, articles from this issue are cited herein.

rules, limits, and/or constraints. In some games, one encounters a "fictitious, whimsical or artificial situation" that requires some degree to skill, strategy, and sometimes luck to overcome (Sauvé et al. 2007, 253). Indeed, one of the most compelling aspects of contemporary gaming is the intense focus on *world-building*—the design of fictive landscapes. *No Man's Sky*, an adventure-driven game, boasts 18 quintillion life-size planets, which were created entirely by algorithms (Parkin 2015). One could literally spend an entire lifetime of exploration within *No Man's Sky* and still not exhaust all the possibilities. Although some games rely upon individual journeying upon distant worlds, others promote competition amongst players a bit closer to home. And, there are many games that necessitate collaboration toward a desirable result. What makes something a game has much to do with the willingness of its players, who often compete in hopes of achieving victory. Although there are many types of games, Carse outlines two archetypal categories—finite and infinite.

Finite games are undoubtedly the most familiar as they focus on the achievement of a particular end, usually but not always a well-defined win condition (1986). For many, if not most, this is the aim of competition, but playing with an individual or group whose sole purpose is winning often dampens the gaming experience, which is always an exercise in uncertainty. Indeed, the only thing that is meant to be predictable within

such games is that there is an order to play and that the game will inevitably end. While finite games are a common form of play experience, Carse presents another modality of gaming that reinforces some of the core axioms of futures.

In contrast to a finite game, the purpose of an infinite game is "continuing play," which is to say that such games mutate over time and necessitate the inclusion of new players and perhaps even new rules. Consequently, infinite games have a greater degree of elasticity regarding what constitutes play. Comparing the rules of an infinite game to the "grammar of a living language," Carse highlights how play links with possibility. As with imagining the future(s), infinite games demand more than just a denial of the ordinary and/or looking beyond the present, they necessitate openness toward the possible.[35] Although finite and infinite games differ in many ways, they ultimately require a shared beckoning of the unknown—an opportunity to embody anticipation and use the future as a resource—by encountering unfamiliar things, situations, and contexts (Miller 2007). In turning to games, this dissertation invokes the infinite game as metaphor for enlivening a politics for geoengineering. As a modality for embodying such a politics, play is positioned as pathway for new epistemological framings toward alternative imaginaries. In the next section, I setup my turn to Causal Layered Analysis (CLA) as a method for

[35] The metaphor, as well as practice, of futures as an "infinite game" is explored more fully in chapter three.

critically analyzing the narrative foundations of geoengineered imaginaries and, perhaps most importantly, generate alternatives.

In search of new metaphors

I opened this investigation with the story of George's experiment *upon* (rather than *with*) the Haida Nation, which illuminates the workings of geoengineered imaginaries. In turning to metaphor—organic gardening, not rocket science—George demonstrates the power of narrative (Milojević and Inayatullah 2015; Inayatullah and Milojević 2015). George's turn of phrase highlights the means by which imaginaries shape norms, condition future(s) potentialities, and, in the case of geoengineering, enliven an all-too-familiar politics. As a means of analyzing the narrative dimensions of geoengineered imaginaries, I employ Causal Layered Analysis (CLA) as a method for deconstructing and reconstructing key narrative framings.

Drawing on poststructuralism, Indian philosophy, and futures studies, Inayatullah assembled CLA as a tool for deploying divergent modes of knowing as critical, as well as reflective, lenses (Inayatullah 1998a; Inayatullah 2004; Inayatullah and Milojević 2015). To mix metaphors, CLA is an apple/onion hybrid—one peels back layer after layer to reach a core myth/metaphor—the deep narratives that engender a certain way of understanding and knowing. In addition to using CLA to excavate core narratives, the tool's layered approach provides a means of

understanding how issues are viewed and understood from divergent, yet interrelated, perspectives. As an analytical tool, CLA begins by looking at that which is most apparent—this is the litany. In this layer, one finds the "black and white" of things, and the frame of "newspaper headlines," or tweets as the case may by, is a common reference for this level. Next, one encounters the system—a reference to the formal structures—economic, educational, and others—predicated on quantitative analyses and data-driven understandings of the world. In the context of politics, the system might best be understood as the "bureaucracy," which is to say the day-in-and-day-out processes and processors that maintain a certain "system."

At the third level, one finds worldview, which is populated with cultural, spiritual, and ideological assumptions. It is at this level where imaginaries comport and contort sense of self and other, and although Inayatullah does not deploy this specific concept, he does note that this is where one looks for the "deeper positions that create notions of collective identity" (2004, 17). Finally, CLA analyses culminate with the myth and/or metaphor layer, which illuminates the power of story and narrative.[36] In addition to working downward, one can also move up and across levels using CLA. Below, I use CLA to look at how George's phrasing gives

[36] This layer is constituted by both myth and metaphor, but I focus on the latter as narrative phrasings have been regularly employed, as evidenced by George's propensity for colorful language.

voice to geoengineered imaginaries.

Given the "universal human receptiveness to stories and metaphors," George's turn of phrase is unsurprising, and it clearly serves as an attempt to downplay the radical potentialities linked to geoengineering (Inayatullah and Milojević 2015, 158). In employing the "organic gardening" metaphor, George intentionally negates the potentially harmful, and ultimately uncertain, side effects of such experiments. Furthermore, George's reference to "rocket science" pokes at the complexities of science and, perhaps most importantly, how the public understands/perceives such experiments. Using CLA, I map the layers of geoengineered imaginaries as expressed, and enacted, by George.[37]

Metaphor
"Organic gardening, not rocket science"
Worldview
"The salmon were the best science result, right?"
Systems
Working to "restore nature"
Litany
"The work can be done by just 100 villages. To become one of the hundred follow this link, we just need 99 more"

[37] As my analysis commences from George's metaphor, I begin with this level and move toward the litany, which is an inversion but demonstrates the fluidity of this approach.

George's invitation seems disingenuous given the fallout from the Planktos incident, and his salesman-like pitch (*To become one of the hundred follow this link, we just need 99 more*) downplays the ethical implications of such experiments, which, as he contends, are mere attempts to "restore nature." At the worldview level, George voices the quintessential Machiavellian perspective: the ends justify the means. Hence, at the deepest level, George's metaphor pulls a lot of weight—it conceals/reveals an all-too-familiar politics.

While I deploy CLA as a critical analytical tool, I also use it as a creative means to put forward my vision of a politics for geoengineering in chapter five. In order for a new politics for geoengineering to emerge, "organic gardening, not rocket science" must give way to new metaphors, especially those that are non-dualistic and speak to the complexities, contradictions, and potential chaos of geoengineered futures. My vision serves not only as the culmination of this investigation but also underlies how this dissertation works as a meta-CLA. Each chapter emphasizes a different layer or level, and in the next section, I sketch out what lies ahead.

Conclusion: Game on

As with my turn toward games and emphasis on play, my utilization of practice-based research, which includes critically reflecting on my own

positionality (including my own guiding metaphor as a practitioner), is meant to challenge the normative boundaries of disciplinary thinking as well as the primacy of "objective" methodologies. In presencing an "interpretive" approach to (social and) political science, I align with Jasanoff's call for modes of scholarship that make us "more aware, less comfortable, and hence more reflective about how we intervene, in word or deed, in the changing order of things" (2010, 249). In working through my proximity to the topic at hand rather than suppressing or bracketing off my own privilege, power, and role as a practitioner, this dissertation offers an interpretive reflection on futures as an enterprise at the interstices of theory and praxis—one focused on holding open a possibility-space for but also through dissent. At its core, however, this dissertation centers on the imaginaries underlying and inspiring geoengineered futures. In support of this aim, I challenge the dominance of scenarios, problematize the "scenario modeling workshop space," and call for new modes of engagement and, ultimately, experimentation.

Employing both textual and practice-based research, this dissertation argues that there are more dynamic and efficacious means to provoke thought about radical potentialities, especially on complex issues such as geoengineering. In turning to games, I argue that play is more than a metaphor—although new stories are also key. Ultimately, I envisage games as enacting a politics that unfolds as "experimentation,

groping in the dark, injection, withdrawal, advances, retreats" (Deleuze and Guattari 1987, 461). Using Deleuze and Guattari's unframing of politics as both theoretical bearing and methodological trajectory, I investigate how play can and might serve as the basis for enlivening a politics for geoengineering by and through collective experimentation. In this way, this project serves as a provocation for those assembling and enacting, even if unintentionally, a politics for geoengineering. In aiming to contribute toward alternative imaginaries, this dissertation attempts to play a new game.

In chapter two, I delve into geoengineering as a potentiality and practice deeply embedded and intertwined within the aegis of the Anthropocene—a complicated, yet widely-used, if not abused, concept that connotes the human impact upon the global climate system. Charting the origin of the term as well as the recent boom in derivative concepts, this interrelated discourse is essential to mapping the complex politics of ongoing geoengineering interventions, proposals, and narratives. While a great deal of attention has been paid to large-scale climate engineering initiatives—primarily solar radiation management (SRM) and carbon capture and sequestration (CCS)—I also include an engagement with cloud seeding, a widely-used practice to enhance precipitation, in an effort to make the actual and perceptual potentialities of climate engineering less esoteric and to highlight questions concerning scale within geoengineered

imaginaries. Finally, this chapter explores climate fiction (cli-fi) as a genre with a particular focus on geoengineered imaginaries. Ultimately, this chapter emphasizes the litany level of geoengineered imaginaries, which is made visible through concepts such as the Anthropocene and the genre of cli-fi.

In chapter three, I look at the shift from global warming to global weirding, which frames my usage of heuristics from postnormal times (PNT). I then map out futures as a practice for expanding dissent via a critical and comparative analysis of two meta-frameworks: Six Pillars method (6P), which is a theoretical and methodological assemblage that provides a comprehensive approach for envisioning and achieving preferred futures (Inayatullah 2008), and the Association of Professional Futurist's (APF) Foresight Competency Model (APF 2016). Using textual and experiential modes of research, I engage with scenarios as a practice and challenge the use of plausibility as a metric with particular attention to pre-created scenarios utilized in workshop settings. I then turn to PNT and review the Three Tomorrows (3T) method, which provides a basis for my invocation of the Menagerie of Postnormal Potentialities (Menagerie). Finally, I build out further the black jellyfish concept and position the Menagerie as a means for enlivening divergent perspectives through the modality of play—what I call *trans-subjective positionalities*. In this chapter, I frame the systems level of geoengineered imaginaries, which is

driven by predominance, and perils, of plausible scenarios.

In chapter four, I open with Latour's distinction between "matters of fact" and "matters of concern" to explore the tensions underlying and inherent to geoengineered imaginaries. I then turn to explore how play can serve as both a strategy and tactic of engagement via practice-based reflections. I review two scenario-based futures projects commissioned by the United Nations and then look at the 2X2 Scenario Exploration System (2X2 SES). These cases were selected as they reflect my development as a professional futurist and, perhaps most importantly, both featured games. In this chapter, I further refine the concept of *trans-subjective positionalities* by looking at how such an approach can and might be enhanced via playful modalities. In chapter four, the worldview level of geoengineered imaginaries becomes apparent via the tension between facts and concerns as well as the degree to which dissent comes to the fore.

In chapter five, I draw on both theoretical works, primarily object-relation mapping (Banks 2014), experiential futures (Candy and Dunagan 2017), as well as practice-based reflections on my own experience implementing games to outline a brief for an alternative futures-driven game designed to critique, create, and ultimately contest geoengineered imaginaries—in short, a game to enact an alternative politics for geoengineering. In this chapter, I also return to CLA as a critical tool for

analyzing the Oxford Principles, which provide guidelines for research but also gesture toward the complexities of governance and implementation. My reading reveals the concealed politics of geoengineered imaginaries and sets up my own vision.

My conclusion provides an opportunity to review each chapter's main arguments, further situate my own positionality as a practitioner, reflect on the contributions of this project, and offer some future(s) research trajectories.

Chapter 2: Geoengineered Imaginaries

A rose by any other name

In 1873, Antonio Stoppani, an Italian geologist, used the phrase "Anthropozoic era" to refer to what he saw as the geologic-scale impact of human activity (Stoppani 2013, 36). Employing a prescient perspectivism, Stoppani observed:

> How much of the earth's surface by now disappears under the masses that man built as his abode, his pleasure and his defense, on plains, on hills, on the seashores and lakeshores, as on the highest peaks! By now the ancient earth disappears under the relics of man or of his industry. You can already count a series of strata, where you can read the history of human generations, as before you could read in the amassed bottom of the seas the history of ancient faunas (Stoppani 2013, 38).

As one of, if not, the earliest scientific voices to note the abiding, which is also to say geologic, impact of human activity, Stoppani's pronouncement was certainly rare for its time, although he was not alone in perceiving large-scale change.

In the early 1920's, a Russian scientist, Vladimir Vernadsky, along with two French philosophers, Edouard Le Roy and Pierre Teilhard de Chardin, gave birth to the concept of the *noosphere*, which drew on Darwinian notions of evolution to assert the predominance of humanity in shaping the earth's life systems. Usage of the term would increase exponentially in the early and middle decades of the 20th century, although a debate concerning its progressive connotations would develop. This

divide, which pitted those championing human-driven transformations against those weary of the implications of a truly human-centric world, resonates with contemporary concerns about the underlying, which is also to say political, dimensions of the Anthropocene, which was coined, at least in part, to "guide mankind towards global, sustainable, environmental management" (Crutzen and Stoermer 2000, 18). Among his contemporaries, Vernadsky is noteworthy as he specifically observed that humanity has become a "planetary geological agent" (Samson and Pitt 1999, 3).

Amidst the rise of environmentalism and sustainability during the latter half of the 20th century, many have been keen to identify conceptual frameworks that encompass the challenges and opportunities of life in "the Anthrocene," which is the proto-term used by Andrew C. Revkin in *Global Warming: Understanding the Forecast* (1992) to denote "a geological age of our own making" (Revkin 2008). By the time Crutzen "made up the word on the spur of the moment," which is perhaps a bit of an embellishment given the term's rich conceptual history, not to mention Stoppani's *Anthropozoic* and Revkin's *Anthrocene*, the idea that human activity was having significant impacts on the planet's biosphere was becoming more well-established, at least in the scientific community (Pearce 2007, 21).

In response to the nearly, but not quite absolute, scientific consensus

that human activity is the primary driver of global warming and, by extension, climate change, a 2008 petition was put forth by the Stratigraphy Commission of the Geological Society of London to have the Anthropocene listed as the most recent epoch of the geological time scale (Zalasiewicz et. al 2008). In 2011, the Geological Society of America selected a conference thematic reflective of the increasing academic accord that the planet has indeed entered a new age—the gathering was entitled: *Archean to Anthropocene: The past is the key to the future*. Crutzen and Stoermer's ubiquitous neologism has become "widely accepted in the global change research community," but the Anthropocene's rising omnipresence within popular culture, especially media outlets, gestures toward the broad ethico-political, if not existential, implications of establishing a new geologic era (Steffen et. al 2011, 843). In 2016, the term made it through a serious test when it was unanimously passed through a working group at the International Geological Congress (Carrington 2016). Now, it must clear additional scientific bodies before becoming institutionalized, although the term has already assumed a "rightful place as a focal point in the culture wars over the recognition and interpretation of environmental process" (Autin and Holbrook 2012, 61).

At the core of the Anthropocene's origins there are a series of contestations over the science concerning the historical impact of humanity on the global climate system. On one hand, there is a strong

argument for the Industrial Revolution, specifically the advent of the steam engine (1784), which is when polar ice records an increase in concentrations of CO_2 and methane (Crutzen and Stoermer 2000; Crutzen 2002). As the starting point for the debate, Crutzen and Stoermer's selection of the advent of the Industrial Age would appear to make the most sense given the dramatic socio-environmental changes over the last few centuries. On the other hand, Ruddiman makes a case that "the Anthropocene actually began thousands of years ago as a result of the discovery of agriculture and subsequent technological innovations in the practice of farming," which accounts for "anomalous gas trends" found in ice-core records (Ruddiman 2003, 261).

Ruddiman's early-Anthropocene hypothesis, which pushes the start date back around 8,000 years, would decimate the Holocene and, as one might expect, has drawn many critics, some of whom argue that limiting the scope of analysis solely to the planet's atmospheric composition is highly problematic. Contending that the "golden spikes for the Anthropocene" ought to be found in the ground, Certini and Scalenghe argue that a more prudent start date is when "much of the terrestrial surface of the planet was altered appreciably by organized civilizations" (Certini and Scalenghe 2011, 1273). Noting changes that took place roughly millennia ago due to widespread agricultural activity, such as terracing and land-leveling, Certini and Scalenghe posit, "The

Anthropocene is, by definition, the period when human activity acts as a major driving factor, if not the dominant process, in modifying the landscape and the environment" (Certini and Scalenghe 2011, 1272). It should perhaps not be surprising that geologists would make such a terra-centric claim, especially as the fate of the concept, scientifically speaking, appears to rest firmly in their hands. Although the Anthropocene's official status remains ensconced within and intimately tied to geology, the term has already assumed a "rightful place as a focal point in the culture wars over the recognition and interpretation of environmental process" (Autin and Holbrook 2012, 61).

While most of the pushback against the term and its adoption within the accepted vernacular centers on a cosmological aversion to science itself, Steffen argues strenuously for preserving the Holocene on grounds that the immense uncertainty that lies ahead has less to do with dynamic environmental changes than it does with humanity's capacity to engineer planetary life systems, which some see as the logical extension of the Anthropocene. He reflects, "There is no human-designed set of planetary conditions that we know of that will suit us better. We don't want the Holocene to end: the whole point is that we want to go back to lower greenhouse gas concentrations in order to continue the Holocene climate indefinitely, as long as we possibly can" (Steffen 2012). In rejecting the Anthropocene, Steffen highlights the fact that the concept merely offers a

diagnosis and pays little attention to the momentous changes initiated by humanity in the past century alone.

Zalasiewicz and colleagues offers a more radical means by which to target the start date for the Anthropocene—one that does much to account for the stakes of the designation and the complexities of the human impact on the planet's life systems. They explain, “From a practical viewpoint, a globally identifiable level is provided by the global spread of radioactive isotopes created by the atomic bomb tests of the 1960s; however, this post-dates the major inflection in global human activity” (Zalasiewicz et. al 2008, 7). Although not a likely candidate for the official start date, as the authors profess, affirming the Anthropocene's potential destructiveness on an appropriate scale denotes the severity of the social, environmental, and political challenges that lie ahead. It is with this particular framing that one can begin to see how this debate is deeply interrelated to ongoing discourses surrounding geoengineering—the techno-fix *par excellence.*

In light of the role of technological advancements, from the advent of the steam engine to the more recent apotheosis of algorithms, in precipitating and, as some hope, assuaging the challenges of the Anthropocene, Berthon and Donnellan suggest that a more fitting moniker might be the Technopocene, which they suggest promotes “a new level of mindfulness on the part of humans for themselves and their technological

offspring" (Berthon and Donnellan 2011, 5). The Technopocene[38] provides a more acute diagnosis, and, perhaps, prognosis of and for the challenges of the Anthropocene, especially as many feel that the only way to avert crisis may be to double-down, by engineering more prudently and consciously the planet's complex adaptive life systems. While the Technopocene has not reached the ubiquity of its antecedent, there is much to be said for selecting an appropriate designation for what humans have done and are continuing to do to the planet, especially in light of the rising interest in geoengineering. Although large-scale climate engineering will impact everyone and everything on the planet, not all humans have played an equal part in global warming.

Providing a more acute accounting of the inequities driving and underlying global warming, Grove posits an appellation centered on the unique milieu from which our current crisis emerged. He argues:

> It was a European elite that developed a distinctively mechanistic view of matter, an oppositional relationship to nature, and an economic system indebted to geographical expansion. The resulting political orders measured success by how much wealth could be generated in the exploitation of peoples and resources. The geological record bears the mark of this European assemblage of hierarchies (2016).

Grove's provocation re-centers colonialism at the heart of climate change, and, perhaps most importantly, offers a critical lens from which to examine

[38] Just a few months after Berthon and Donnellan, Margaryan coined "the Technocene" in response to an editorial published in *Nature* that argued for the necessity of the Anthropocene.

the asymmetric affects of global warming, which will disproportionally impact the global South and, as such, ought to be seen as a neocolonial power mechanism (Field et al. 2014). The Eurocene's hierarchies are most evident in the literal modes of production that have accelerated climate change, and the earth bears indelible scars from centuries of intensive resource acquisition and extraction. As a concept, the Eurocene presences the imperial roots of the desire to christen a new geologic age.

Furthering Grove's insight and observing the specific impacts of technological "development," Parikka coined the term Anthrobscene to mark the "various violations of environmental and human life in corporate practices and technological culture that are ensuring that there won't be much of humans in the future scene of life" (Parikka 2014). Parikka's invocation of an ethical, if not aesthetic, position—evident in his intentional play on words—calls attention to the "obscene" practices and systems facilitating techno-culture's expansive and destructive reign. As with atmospheric CO_2 concentrations, which models suggest could affect the global climate system for hundreds or thousands of years even if all emissions ceased tomorrow, Parikka contends that there is no way to undo the structural changes that techno-culture has had on the planet (Frölicher et al. 2013). Indeed, geoengineering aims only to remediate the rise in global average temperature, which means that it can, at best, only be part of other solutions focused on healing planetary life systems that

are woefully imbalanced, which has driven a veritable explosion in critical responses.

Rather than focusing on the causes of the Anthropocene, some have argued that the concept does not go far enough in accounting for underlying roots and potential outcomes. Indeed, there are many signs pointing toward an extinction-level event, which, as Chakrabarty contends, would make any designation "too low in the hierarchy of geological periods" (Chakrabarty 2016, 106).[39] Critiquing the underlying assumptions driving the Anthropocene origin's debate, Chakrabarty takes on history, freedom, and how the shadow of modernity continues to loom in framings and responses to climate change. He observes:

> While there is no denying that climate change has profoundly to do with the history of capital, a critique that is only a critique of capital is not sufficient for addressing questions relating to human history once the crisis of climate change has been acknowledged and the Anthropocene has begun to loom on the horizon of our present. The geologic now of the Anthropocene has become entangled with the now of human history (Chakrabarty 2009, 212).

The entanglements of the Anthropocene—which can be seen through the many and varied derivative concepts[40] it has spawned—illuminate the linkages between the injustices of the past, the inequities of the present,

[39] It is worth noting that Chakrabarty's observation is the direct result of a personal communication with Zalasiewicz.

[40] Beier's accounting boasts a litany of terms: "Capitalocene, Eurocene, Anthrobscene, Chthulucene, Plantationocene, Plasticene, Misantanthropocene, Betacene, Planthropocene, Thermocene, Thanatocene, Phagocene, Phronocene, Agnotocene, Polemocene, Anglocene, Metropocene, Gynocene, Manthropocene, Sociocene, Homogenocene, Econocene, Aerocene, Growthocene, and Palaeoanthropocene" (2018, p. 370). Interestingly, she omits both Technopocene and Technocene.

and unpreferred trajectories for the future(s).

As a means of combating this dynamic, a multi-signatory comment published in *Nature* argues that "developing countries" should "play a central part in research and discussions around solar geoengineering" (Rahman et al. 2018, 23). Writing from a similar perspective, some within the humanitarian sector have argued that the "most vulnerable" must be directly engaged so that they might "form an opinion and perhaps influence formal governance processes" (Suarez et al. 2013). While additional inclusion in the establishment of governance processes for geoengineering sounds well and good, there are many who find the implicit appeal to authority of statist agents, as well as international agencies such as the UN, a mere extension of the colonial systems and imperial mechanisms that brought about our collective crises, which will not (and has never been) shared equally amongst all parties (Klein 2014; Whyte 2012a; Whyte 2012b; Whyte 2013). This points toward one of, if not, the inherent biases of the ongoing Anthropocene debate—an appeal toward universalism (Zahara 2017). Indeed, the very concept itself rests on an uneasy consensus—a tacit agreement that while we "may not experience ourselves as a geological agent, […] we appear to have become one at the level of the species" (Chakrabarty 2009, 221). Interestingly, Chakrabarty begins his essay with a gesture toward Weisman's *World Without Us*, which imagines a post-human Earth.

Reflecting on Weisman's provocation, Chakrabarty writes, "It is not surprising then that the crisis of climate change should produce anxieties precisely around futures that we cannot visualize" (Chakrabarty 2009, 211).

While Chakrabarty cannot visualize such futures, the realities of climate change and radically unpreferred potentialities, including geoengineering, are nothing new for those who have been on the frontlines of *ecocide* for generations (Klein 2014). Perhaps such futures produce anxiety not because they are unimaginable but precisely because they surface the truly unthought—a reckoning with the horrors of the past, the injustices of the present, and the uncertainties of the future(s). As such, the deepest challenge at the heart of the Anthropocene lies within a simple query—one that has come to define futures: what's next?[41] (Dator 2005). In is certainly the case that geoengineered futures have become easier to visualize and positioned as "what's next," in no small part due to the proliferation of news coverage and a spate of media imaginings (Luokkanen et al. 2014). While geoengineered imaginaries have become more diffused, uncertainty surrounding the effects of climate engineering have grown exponentially as well, particularly as numerous models show uncertain affects across a range of regions (Batten and Gower 2014;

[41] In his recounting of decades as a futurist, and specifically the rapidity of change, Dator contends that "every good futurist" must ask this simple question, even, and perhaps especially, when one seems to have achieved their preferred future (Dator 2005, 381).

Bodle et al. 2012; Courvoisier et al. 2018; Fuentes-George 2017; IPCC 2012; National Research Council 2015a; National Research Council 2015b; Royal Society 2009; Williamson et al. 2012a; Williamson et al. 2012b). In short, such stories cannot rely solely on data extrapolation. This is due, at least in part, to the variability of climate models, which has improved greatly but continues to be imperfect, especially when simulating cloud formation and tropical precipitation (Edenhofer et al. 2015; Randall et al. 2007; Zscheischler et al. 2018).

In light of this dynamic, geoengineered futures have been devised, promulgated, and accelerated, even though numerous studies clearly show that the public, broadly defined, has limited knowledge of climate engineering processes and their potential implications and impacts (Asayama et al. 2017; Burns et al. 2016; Burns and Strauss 2014; Cairns 2015; Carr et al. 2013; McLaren et al. 2016; Nicholson et al. 2013; Scheer and Renn 2014; Sugiyama et al. 2017). In the next section, I map the two major climate engineering proposals—solar radiation management (SRM) and carbon capture and sequestration (CCS)—as well as more boutique ideations, such as glacial geoengineering and marine cloud brightening. This review furthers my investigation into the contours of geoengineered imaginaries.

The Pinatubo effect

Mount Pinatubo sits near the western coast of central Luzon, the

largest island of the Philippines, and holds almost 50% of its overall population. In 1991, an increase in earthquakes heralded an awakening. The surrounding area's geologic record shows that Pinatubo has a history of gargantuan eruptions, some of which lasted decades or longer (Newhall and Punongbayan, 1996). On June 15, 1991, Pinatubo's grumblings reached a zenith with an ash plume rocketing an estimated 34 kilometers (21 miles) high. When these particles entered and subsequently circulated the stratosphere, they blocked a sufficient amount of solar radiation to cool the Earth's surface. The effects of Pinatubo lowered the global average temperature by half a degree Celsius, or almost one whole degree Fahrenheit (Burns 2011; Hansen et al. 1992; Keith 2013). As the strongest volcanic eruption since Krakatoa in 1883, Pinatubo gave researchers and scientists an extraordinary opportunity to study how such events affect the global climate system, specifically how stratospheric aerosols—in this instance volcanic ash—impact the Earth's albedo, or reflectivity.

James Hansen gained notoriety following testimony given before the U.S. Senate Committee on Energy and Natural Resources in 1988. At this meeting, he famously stated that NASA was 99% confident that an increase in global average temperature was anthropogenic in origin. Following the Pinatubo eruption, Hansen led a team of researchers to examine the effects of this mass injection of particulates into the

stratosphere. They predicted that the cooling "[…] should even overwhelm global warming […]" (Hansen et al. 1992, 215). And, they were right, as the cooling effects from the Pinatubo eruption were felt for years, which impacted a range of life systems (Trenberth and Dai 2007).

The hydrological cycle acts a pump whereby the Earth circulates its most valuable and life-giving resource: water. Evaporation from fresh- and sea-water bodies moves to the skies and eventually condenses as clouds that produce precipitation. There are a range of variables that effect the amount of water moving through the hydrological cycle, particularly air, oceanic, and surface temperatures (Beniston 2003; Shen et al. 2008). Given the dramatic and sudden impact that Pinatubo had on surface temperatures, some were not surprised when 1992 was recorded to have "a peak percentage of global land areas under drought conditions" (Dai et al. 2004; Trenberth and Dai 2007). This connection is troubling as some have recommended mimicking “the Pinatubo effect,” although proposals to cool surface temperatures by “managing” solar radiation could have the same result with uncertain impacts on the hydrological cycle (Dai et al. 2004; Nalam et al. 2018; Shen et al. 2008; Trenberth and Dai 2007).

Solar radiation management (SRM), which is also sometimes referred to as solar climate engineering (SCE), has been given increasing attention as some think large-scale engineering initiatives might be the only feasible means to combat global warming, although such scenarios

contain a range of uncertainties (Ban-Weiss and Caldeira 2010; Allenby 2005; Budyko 1977b; Cicerone et al. 1992; Cicerone 2006; Crutzen 2006; Fleming 2010; Keith 2000; Keith 2001; Keith 2013; Kintisch 2010; Penner et al. 1984). While Pinatubo exponentially increased interest on SRM, the idea of geoengineering using stratospheric aerosols to reflect solar radiation actually has a much longer history. In 1977, the American Geophysical Union translated the work of Mikhail Budyko, a Belarussian climatologist, who argued "it may be feasible to modify the aerosol layer of the stratosphere in the near future" (1977a, 242). In honor of his groundbreaking work, some have resorted to calling SRM proposals "Budyko's Blanket," and advocates for this approach often champion the notion that it would be "fiendishly simple" and "startlingly cheap" (Levitt and Dubner 2011). An article published in 1984 in *Acta Astronautica* extended Budyko's ideas and argued that retro-fitted commercial planes could deliver the payload, which would limit the need for proprietary deployment methods (Penner et al. 1984). In 1992, a proposal was made to inject particulates, specifically ethane or propane, into the stratosphere above the poles as a means of combating ozone depletion[42] (Cicerone et al. 1992). While all of these proposals were published in scientific

[42] It should be noted that ozone depletion, particularly above Antarctica, has reversed due to the coordinated phasing out of chlorofluorocarbons (CFCs), which were commonly used propellants for numerous aerosol-based products, such as hairspray. The Montreal Protocol is widely considered to be "one of the most successful and effective environmental treaties ever negotiated and implemented" (Rae 2012). Given its success, some have argued that the treaty "could be expanded to quell concerns and guide the relevant research" on climate engineering (Andersen 2012, 415).

journals, none raised the level of discourse and profile of geoengineering, and SRM in particular, as much a 1992 report by the Institute of Medicine, National Academy of Sciences, and National Academy of Engineering.

Policy Implications of Greenhouse Warming: Mitigation, Adaptation, and the Science Base featured an entire section devoted to geoengineering with an emphasis on feasibility, particularly for SRM. Calling for an aggressive research agenda, one that would study "considerations of reversibility," the report provided one of the most enduring formulations of geoengineering, and SRM in particular, as a practice: "the large-scale engineering of our environment in order to combat or counteract the effects of changes in atmospheric chemistry" (Institute of Medicine, National Academy of Sciences, and National Academy of Engineering 1992, 433). Covering a range of SRM deployment methods the report makes no mention of the impacts such proposals might have on the hydrological cycle or, perhaps even more alarmingly, the need for international management and cooperation. It does note, however, that a potential side effect of SRM, as with volcanic eruptions, could be "spectacular sunsets" (Institute of Medicine, National Academy of Sciences, and National Academy of Engineering 1992). Although concerns surrounding the side effects of SRM proposals continue to emerge, the Institute of Medicine, National Academy of Sciences, and National Academy of Engineering has the honor of being

the first to call attention to the potentiality of spectacular sunsets, which speaks to the sometimes obtuse ways with which geoengineered imaginaries are promulgated.

SRM is undoubtedly the easiest target for skeptics and conspiracy theories, although serious research on deployment methods has not been thwarted.[43] David Keith is one of the most vocal proponents of the need for further SRM research. He currently holds a dual appointment as the Gordon McKay Professor of Applied Physics at the Harvard John A. Paulson School of Engineering and Applied Sciences and Professor of Public Policy at the Harvard Kennedy School. Keith, however, is quick to separate his academic work on SRM from his other efforts, which includes a position with Carbon Engineering, a Canadian firm specializing in the development of fuels from CO_2 using direct air capture (DAC) methods. In 2017, Keith received approval for a small-scale SRM research experiment—one of the first of its kind.

The stratospheric controlled perturbation experiment (SCoPEx) has been designed to study the impacts of aerosol distribution location and size as a means of weighting the "risks and efficacy of SRM" (Dykema et al. 2014, 17). Although SCoPEx will use standard materials, such as

[43] One of the most concerning aspects surrounding SRM is the connection made between research-based proposals and chemtrails, which is a conspiracy theory based on the idea that planes are already spraying a range of chemicals to control the weather, poison people, and, in general, enable a nefarious agenda whose overall aim is unclear. Unfortunately, recent research has shown that geoengineering has become inextricably linked to the chemtrail conspiracies on social media (Tingley and Wagner 2017).

calcium carbonate, to generate insights on optimal aerosol deployment distribution, Keith has published research on more technologically advanced interventions, specifically engineered nanoparticles, which would greatly improve the amount of "control" over deployment and extend the overall lifetime of the engagement—two of the main challenges of SRM (2010, 16428). There are a number proposals for using a range particulates and materials, including a sunshade “near the inner Lagrange point (L1), in-line between the Earth and sun” (Angel 2006); glass bubbles (Walter 2011); and “land and space based mirrors” (Weber 2012). Such methods, as with Keith's invocation of nanotechnology, raise another critical issue surrounding climate engineering, specifically SRM: patenting (Reynolds et al. 2018). A “land grab” on geoengineering patents is already underway, which could stifle research, centralize deployment, and foment possible intellectual property rights litigation (Chavez 2015; Parthasarathy et al. 2010; Reynolds et al. 2018). Interestingly, it was a concern over patenting that led to the cancellation of a high-profile SRM experiment in the United Kingdom in 2012 (Cressey 2012).

Most researchers are vehemently against privatization and believe that "commercial development cannot produce the level of transparency and trust the world needs to make sensible decisions about deployment" (Keith 2018). Keith’s position has evolved over the years and points toward the ways with which geoengineered imaginaries have shaped the

ongoing public discourse on such futures. In 1992, which was on the heels of the Institute of Medicine, National Academy of Sciences, and National Academy of Engineering report, Keith and Dowlatabadi observed that geoengineering "implementation requires fewer cooperating actors than abatement" (1992, 289). Any sensible decision, which implies one achieved via cooperative means, must certainly be informed by any and all potential side effects and have responses to any and all critiques.

One of the most damning critiques of SRM has to do with potentiality for negative impacts on the ozone layer, which prevents a majority of ultraviolet radiation from making it to the surface (Crutzen 2006; House of Commons Science and Technology Committee 2010; Rasch et al. 2008). Although accelerating ozone depletion is worrisome, studies have revealed a far more troubling dynamic: if a large-scale initiative were to be undertaken, some argue that ceasing maintenance would be nothing short of catastrophic as "there is high confidence that global surface temperatures would rise very rapidly to values consistent with the greenhouse gas forcing" (IPCC 2013). In simple terms, a start-and-stop strategy, which would produce a termination effect, could create a rapid (over a few decades or less) spike in surface temperatures, leading to disastrous impacts on a variety of life systems (Jones et al. 2013; Muri et al. 2018; Trisos et al. 2018; Zhang et al. 2015). Consequently, SRM entails a commitment unlike anything ever attempted in human history,

although comparisons to nuclear waste disposal and storage are sometimes made (Baum 2014; Burns and Strauss 2014). As some models situate the necessary follow through on SRM to hundreds or perhaps even thousands of years, it becomes clear that some of the weightiest issues surrounding SRM are non-technical (Cao and Caldeira 2008; Caldeira and Rampino 1991; Winkelmann et al. 2015). Even the IPCC, which makes notoriously conservative estimates, argues, "proposed methods will need to consider timescales extending at least up to, and likely well beyond, 2100'' (Edenhofer et al. 2015, 4).

Although the challenges of SRM are plentiful in both scope and scale, its low cost and minimal deployment barriers have raised concerns that unilateral deployment is a potentiality worth taking seriously. As Brand writes, "As soon as climatic conditions become frightening and urgent, geoengineering schemes will suddenly jump from 'plausible but dangerous' to 'dangerous but we have no choice.' The cost is low enough that a single nation or even a wealthy individual could set in motion a geoengineering project that would affect everyone on Earth" (Brand 2010). Echoing Brand, Cascio observes, "[…] it is a near-certainty that someone (nation or wealthy non-state actor) will attempt to engage in geoengineering to head off utter disaster, allowing sufficient time for slower preventative solutions to take hold" (Cascio 2009, 21). Similarly, Deudney and Grove contend, "[…] actors could unilaterally select

geoengineering projects for their distributional advantages, thus turning climate change into a realm of zero-sum competition" (2009). Parson and Keith reflect, "Geoengineering is not arms control, at least for now. But if states fail to build cooperation and transparency now when stakes are low, it could become as difficult and fraught as arms control, or more so, in some future of severe climate change" (2013, 1279). Explicating the ramifications on a softer scale, Rabitz argues that unilateral action "could take the form of directional leadership" or even "grant an actor significant leverage in international negotiations" (2016, 106). As the above array of insights suggest, SRM could serve as a tactical and strategic maneuver to serve a variety of ends, even though some believe that the potential political costs would be severe and likely prohibit implementation (Bodansky 1996; Bodansky 2011; Hanafi and Hamburg 2013; Horton 2011; Millard-Ball 2012; Larson 2016).

While unilateral SRM might not be palatable, the inability of any and all contemporary governance structures to cope with climate engineering, and SRM in particular, is a concern that many have noted (Banerjee 2011; Bipartisan Policy Centre Task Force on Climate Remediation Research 2011; Bodansky 1996; Bodansky 2011; Brent et al. 2018; Cicerone 2006; Cicerone et al. 1992; Hamilton 2013; Hanafi and Hamburg 2013; House of Commons Science and Technology Committee 2010; Larson 2016; Millard-Ball 2012; Reynolds 2016; Royal Society 2009; Stilgoe 2015;

Stilgoe 2016; Szerszynski et al. 2013). A lack of appropriate governance, however, has not stopped advocates from seeing the sunny side of things, so to speak. As Schelling opines, “One thing that can be said for geoengineering is that it immensely reduces the complicatedness of what nations have to do internally to cope with greenhouse problems and what nations have to do internationally to cope with greenhouse problems” (1996, 307). Balancing internal versus international and local versus global interests is essential to executing any meaningful climate engineering initiative and developing potential governance mechanisms to oversee research and potential deployment. While large-scale environmental treaties, such as the aforementioned Montreal Protocol, have been successfully forged and properly policed, governance for geoengineering would certainly require thoughtful and continuous cross-scale policy experimentation (Reynolds 2018; Stilgoe 2015; Stilgoe 2016). At present, there are no global institutions that have come out in full support of climate engineering, although the United Nations Framework on Convention on Climate Change has called for "sinks and reservoirs of greenhouse gases," which harkens back to one of the earliest mentions of climate engineering in a scientific journal (UNFCCC 2015).

In 1977, Marchetti published "On geoengineering and the CO_2 problem" in the first issue of *Climate Change*. In this seminal article, Marchetti calls for a process whereby "CO_2 is partially or totally collected

at certain transformation points and properly disposed" (1977). Proposing the utilization of currents to "carry and spread [CO_2] into the deep ocean," he notes how ground storage may also be an option, specifically reclaiming "exhausted gas fields" for sequestration (Marchetti 1977). In stark contrast to SRM, proposals for carbon capture and sequestration (CCS) are widely considered to be a necessity alongside concerted efforts to reduce greenhouse gas emissions, especially to meet current targets (Anderson 2015; Courvoisier et al. 2018; National Research Council 2015; Neslen 2015; UNFCCC 2015). CCS has also gotten a boost from recent studies that show the overall cost to be much lower than previously estimated (Keith et al. 2018).

Carbon Engineering's DAC pilot project, which has been operational since 2015, halved previous cost estimates, which gestures toward commercial viability, although the researchers contextualize their findings as "a low-risk starting point rather than a fully optimized least-cost design" (Keith et al. 2018, 20). A breakthrough in negative emission technology (NET) could bring geoengineering to the fore of future climate negotiations. Given the vast differences in overall scope and impact, some have argued that NET should not be classified as geoengineering but rather as an integral part of an "overall mitigation strategy" (Lomax et al. 2015, 128). Disaggregating NET from SRM is also a calculated move aimed at better distinguishing between the uncertainties, regulatory

implications, and policy demands between the two (Heyward 2013). Although SRM and CCS remain the two primary proposals, a handful of other approaches have come to the fore.

Forestalling glacial retreat is essential to diffusing sea-level rise, and studies suggest, "the costs of such projects appear comparable to those of other large energy and civil-engineering works" (Moore et al. 2018, 305). From blocking warm waters and artificially supporting ice shelves in Antarctica, glacial geoengineering could have “fewer global environmental impacts” than other approaches, although this method does nothing to stop increased warming (Moore et al. 2018, 304). As with other approaches, glacial geoengineering would necessitate substantial front-end investment with limited effect, which has led some to consider methods that piggyback on existing processes. Container transport vessels, which revolutionized trade and dramatically accelerated globalization, emit a range of particulates, including sulfur dioxide (SO_2) (Bernhofen et al. 2016). Given that SO_2 that supports cloud formation and, as such, increased albedo, some have argued that such vessels engage in "inadvertent geoengineering” (Fuglestvedt et al. 2009, 9060). In order to be effective, marine cloud brightening (MCB) would take no less than a doubling of clouds in specific regions to offset atmospheric CO_2 concentrations (Cao et al. 2015; Rissman et al. 2004; Salter et al. 2008). Models, however, suggest that MCB would decrease global average

rainfall, even though precipitation over land could increase (Bala et al. 2010; Latham et al. 2012). As with all climate engineering methods, there are risks and uncertainties beyond any and all means of calculation. The limits of modeling are apparent to those working in the field, but how this uncertainty will factor into decision-making on further research and possible deployment remains to be seen. Geoengineered imaginaries already reflect varying degrees of uncertainty, even if implicitly, and one need only look at cloud seeding—a widely used practice for manipulating precipitation—to see that efficacy is not a requisite condition for proposed implementation. In the next section, I examine historic and contemporary cloud seeding practices to delimit the contours of geoengineered imaginaries at both local and national scales.

What's worse...dropping bombs or rain?

During a 1997 conference on Terrorism, Weapons of Mass Destruction, and U.S. Strategy, then U.S. Secretary of Defense William Cohen joined Senators Nunn (D-Georgia) and Lugar (R-Indiana) to answer a few audience questions. This is when things got interesting. In the wake of a fake biological agent attack on B'nai B'rith—an international Jewish service organization headquartered in Washington, D.C.—that occurred just a few days earlier, an audience member asked Secretary Cohen about preparations for future threats. In a surprisingly stark, and somewhat meandering, riposte, Cohen opined, "Others are engaging even

in an eco-type of terrorism whereby they can alter the climate, set off earthquakes, volcanoes remotely through the use of electromagnetic waves'' (U.S. Department of Defense 2013). Cohen's off-the-cuff comments rose more than a few eyebrows and highlighted the long-standing interest of statist, military, and intelligence agents—U.S. and otherwise—in environmental modification and/or weather manipulation (House et al. 1996; Fleming 2010).

Dispersing lead and silver iodide to support increased cloud production, the U.S. military worked with the Central Intelligence Agency (CIA) to coordinate thousands of individual missions over five years aimed at extending the monsoon season to "increase rainfall in carefully selected areas to deny the enemy use of roads by: (1) softening road surfaces; (2) causing landslides along roadways; (3) washing out river crossings; and (4) maintaining saturated soil conditions beyond the normal time span" (Doolin 1974). Operation names varied (Popeye, Intermediary, and Compatriot), but extensive media coverage—first from the Washington Post in 1971 and then front page coverage in the New York Times in 1972—led to the abandonment of the project accompanied by a sharp turn in position, hastening the adoption of the Weather Modification Regulation

Act in 1974 by the U.S. Congress[44] (Haskell 1974). Following wider revelations, the U.N. 'Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques or Environmental Modification Convention (ENMOD) came into force in October 1978 (United Nations 1978). At present, ENMOD has been ratified by only 20 countries with another 48 countries as signatories and 78 as official party to the treaty (United Nations 1978; Hamblin 2013). Although the State Department never publicly declared that any such operation was successful, an official speaking off the record opined, "What's worse…dropping bombs or rain?" (Hersh 1972). It's hard to argue with that kind of logic, although ENMOD did little to quell interest in weather modification. Quite the contrary, the practice has grown exponentially since.

When Beijing was awarded the 2008 Summer Olympic Games, many were concerned that poor weather, as well as the city's rampant air pollution, might dampen the festivities. To prevent international

[44] Interestingly, although perhaps not surprisingly, there are direct connections between weather modification and the University of Hawai'i. Harlan Cleveland, who served as President of the University of Hawai'i system from 1969 to 1974, was appointed as Chair of the Weather Modification Advisory Board, which was created by the Department of Commerce. Cleveland played a central role in overseeing cloud seeding experiments, which were outlined in the 1978 report: *Weather Modification: Programs, Problems, Policy, and Potential* (Committee on Commerce, Science, and Transportation 1978). The report also states that, under Cleveland's direction, the Board was tasked with "examining the potential problems of liability of the United States for damage done by official U.S. weather modification activities (1978, 448). Cleveland was also active in the World Futures Studies Federation and attended the group's 1988 conference in Beijing, China. Jim Dator deserves full credit for highlighting this linkage and furnishing personal insights on Cleveland.

embarrassment, the Beijing Weather Modification Office (BWMO), was tasked with ensuring a dry August, which constitutes the tail end of the Summer rainy season. While the BWMO was formed within the Beijing Meteorological Bureau (BMB) in 1973 to combat hailstorms, the project grew immensely in scope and scale in the years leading up to the Olympics. Chronicling the expansion of the BMB, Jinxia reports, "The weather engineering office wove a defensive web from adjacent provinces to the Beijing suburbs, and 26 control stations were deployed to fend off clouds or delay their movement" (Jinxia 2010, 2808). In total, China is thought to have spent over $100 million dollars to limit rainfall during the 2008 Summer games, and the BMB reported that over 1000 rain dispersal rockets were fired to keep the opening ceremonies dry (Xinhua 2008). While the weather modification efforts of the BMWO during the 2008 Summer Olympics garnered substantial media attention, China has since embarked on an even more aggressive cloud seeding agenda—one aimed at producing more rain across the country. According to the best available information, over 85% of China's 2900 counties have active cloud seeding programs (Liu 2012; Guilford 2013). As Qiu and Cressey report, “Official figures from the China Meteorological Administration say that the country created 250 billion tonnes of rain between 1999 and 2006, an annual production of more than 30 billion tonnes” (2008, 970). China, however, is not alone in seeking to bend the sky’s will to earthly needs,

and it is difficult to imagine that such substantial investments would be made if cloud seeding did not produce results.

According to the report from the Expert Team on Weather Modification Research for 2012/2013 from the World Meteorological Association (hereafter WMA) there were ‘‘42 countries with active weather modification projects’’ in 2011 (Bruintjes 2013). This increased to 52 by 2015 with China, India, Thailand, and the U.S. making substantial investments in both direct projects and research (Bruintjes 2015). Since the WMA relies on self-reporting from member nations, it is believed that the number of actual projects is much higher. Given the lack of clear and transparent information about ongoing initiatives, it is difficult, daresay impossible, to measure, and consequently understand, the potential affects of this widespread practice on the hydrological cycle[45] as well as other life systems. In addition to uncertainties arising from large-scale cloud seeding initiatives, tactical interventions provide little clarity, especially when the circumstances are intentionally obscured.

In April 1986, the Chernobyl nuclear power plant exploded. A range of failures, including safety sub-systems, led to a full-scale meltdown, which catapulted radioactive materials into the atmosphere for

[45] An interesting point to consider here is the degree to which the hydrological cycle ought to be seen as an open versus closed system. Given that all the water on Earth moves continuously through this cycle and that there is only a slight variance in the overall amount of water on the planet, some believe that it should be considered a closed system (Dooge 1968). On the other hand, others argue the interconnections between various life systems and the overall complexity of the global climate system preclude such a classification (de Assis Matos de Abreu et al. 2005).

days. Through research undertaken by a British scientist and testimonials by both local residents and then-Soviet pilots, it has come to light that a cloud seeding operation was undertaken as a means to prevent impacts on population centers, predominantly Moscow (Fleming 2010; Gray 2007; Sparks 2004). In support of this claim, unexpectedly high levels of fallout were recorded "in the Gomel area of Belarus, some 60 miles north of the power plant" (Fleming 2010, 162). Noting the effects of this purported intervention, Sparks reports, "In some contaminated areas of Belarus, thyroid cancers have increased by up to 1,925% and the World Health Organisation says many of those exposed to radiation as children will develop the disease" (2004). While there has never been, and likely never will be, an official admission on the part of either the Russian or Belarusian governments, Major Alexsei Grushin, a former Soviet pilot, has been candid about his participation and even told the British Broadcasting Corporation (BBC) that he was "proud" of his involvement in the operation (BBC 2007).[46] Although this event remains clouded in mystery, some argue that cloud seeding during the 1980 Olympic games, which were held in Moscow, shows that the Soviets possessed the requisite resources and experience to carry out such an operation (Ioffe 2007, 355).

While the Chernobyl incident raises a litany of issues surrounding

[46] My wife was born in southeastern Belarus and remembers the Chernobyl event. In our first discussion of my dissertation research, she suggested that I investigate cloud seeding and specifically look into Chernobyl. As a little girl, she recalls seeing nothing but black skies for days on end.

the utilization of cloud seeding, the invocation of a utilitarian calculus to justify such an operation coupled with the overall lack of transparency, including a conscious choice not to alert the local population, is certainly the most troubling. Consequently, it appears as though the challenges of cloud seeding are inverse to large-scale geoengineering, which is to say that highly localized effects compounded by national-scale dynamics drive most, if not all, of contemporary weather manipulation practices. Such themes are also teased out through fiction.

The BBC's *Superstorm* (2007) was a miniseries about the use of cloud seeding to alter hurricanes. Infusing real science and historical references, such as Project Stormfury—a U.S. government-backed project to divert tropical storms using cloud seeding, the series ran in three parts, each of which was followed by a short documentary on meteorological science, specifically forecasting extreme weather events. In the first episode, the team's research on cloud seeding is used to deflect a hurricane from hitting Miami, but the storm gains strength out at sea and then redirects toward New York City. Footage from 2005's Hurricane Katrina, which decimated New Orleans, is used to imagine the impacts of a category three storm striking New York City. In fictionalizing the affects of such a scenario, which ended up playing out just a few years later, *Superstorm* encapsulates the ethico-political provocations and, at times, prescience of geoengineered imaginaries. In the next section, I explore a

selection of texts from the growing genre of climate fiction (cli-fi), which promulgates a range of geoengineered imaginaries.

When truth is stranger than fiction

In the wake of Hurricane Sandy's destructive path across the Northeastern United States in late 2012, climate change quickly became one of the central issues of that year's election. As then New York City Mayor, Mike Bloomberg, opined, “Our climate is changing. And while the increase in extreme weather we have experienced in New York City and around the world may or may not be the result of it, the risk that it might be—given this week's devastation—should compel all elected leaders to take immediate action” (Bloomberg 2012). While Bloomberg was cautious not to make a direct causal link, his invocation of the immense risks of inaction was telling and pointed toward the growing public consensus of the correlation between global warming and extreme weather events (Gillis 2012; IPCC 2012). Noting the difference between the two major party candidates on the issue, Bloomberg continued, “One sees climate change as an urgent problem that threatens our planet; one does not. I want our president to place scientific evidence and risk management above electoral politics” (Bloomberg 2012). With the re-election of Obama, many were optimistic that efforts to mitigate global warming would move to center stage, and when the President gave a highly publicized speech on the issue in June 2013, it seemed as though such hopes were

not audacious.

In what many consider to be one of the landmark policy addresses of the Obama's second term, he exclaimed, “I refuse to condemn your generation and future generations to a planet that’s beyond fixing. And that’s why, today, I'm announcing a new national climate action plan, and I'm here to enlist your generation's help in keeping the United States of America a leader—a global leader—in the fight against climate change (Obama 2013). While many remain highly skeptical of the notion that the planet can be *fixed* through emission mitigation, Obama's impassioned remarks suggest, as one might expect to hear from an American politician, that the battle against global warming is something that can be fought and won. These sentiments differed markedly from a more somber speech given by another American President on climate change.

Explaining just how high the stakes concerning climate change have become, Joe Benton, the 48th President of the United States, intimates:

> Over the past months since I became your president, I have received information that shows the changes we have created in our global climate are more sever, more accelerated, and more far-reaching them we have understood before. […] We have all come to understand that there will be relocations from threatened areas of our coastal states. […] The hardest truth, the saddest truth that I must tell you is that for the last ten, twenty, thirty years, you were told lies. […] My fellow Americans, when you gave me your trust last November I told you that I would dedicate myself to creating a new foundation for our country […]. But before we can lay the new foundation for our country, we must deal once and for all with the

monster of emissions that terrorizes our world (Glass 2009).

Given the increasing severity of forecast models, many were hoping that Obama's tone was more along the lines of the protagonist from Matthew Glass's 2009 novel, *Ultimatum*, which takes place in the globally warmed world of 2032. Imagining sea-level rise, wildfires, drought, and a tense geopolitical climate, the novel sketches a life-world not too dissimilar from our own—except perhaps for the candor of its elected officials. In following the efforts of President Benton to salvage the remnants of America, and, as it were, save the world, by staunchly enforcing a restrictive Carbon Plan, *Ultimatum* takes a decidedly dystopic turn in suggesting that the threat of catastrophe—specifically the precipice of global thermonuclear war—is the requisite and sole catalyst for substantive change. Although many have come to believe that climate change will act not just as a force multiplier but also as a catalyst for conflict, such scenarios continue primarily to be the domain of fiction[47], which is not meant in any way as a slight against its efficacy (Dyer 2011; Ward 2014).

Explicating the ways with which science fiction interacts with and within contemporary imaginaries, Weldes agrues, "[sci-fi] is not just a

[47] Over the past few years, the U.S. military has made substantial investments in strategic foresight and science fiction aimed at illuminating future threats, technological impacts on the future of warfare, and future areas of conflict. The Army's Training and Doctrine Command (TRADOC) runs a "Mad Scientist Initiative" that focuses on "the future operational environment and its military implications" (U.S. Army Training and Doctrine Command 2018).

'window' onto an already pre-existing world. Rather, [sci-fi] texts are part of the processes of world politics themselves: they are implicated in producing and reproducing the phenomena that [many] assume they merely reflect" (Weldes 12, 2003). As with the other texts in the evolving genre of climate fiction, or cli-fi, *Ultimatum* charts the many and varied impacts of global warming in a world that is at once familiar, but not quite. Cli-fi's recurrent thematics and historicity certainly draws heavily from contemporary research as well science fiction, which is a broad genre that encompasses a range of typologies (James 1994; Weldes 2003; Rieder 2008; Rintoul et al. 2018; Tuhus-Dubrow 2013; Whiteley et al. 2016). As a genre, cli-fi has immense utility for *thinking the political* of geoengineered imaginaries (Shapiro 2010). Over the past century, climate engineering and weather modification have become popular tropes, and ethico-political dynamics often take center stage in these narratives. My reading of three texts, *The Weather Man* (1962), *Extinction* (2005), *The Collapse of Western Civilization: A View from the Future* (2014) centers on specific encounters that stir ethico-political provocations around the core themes of the geoengineering debate: centralization, corporatization, and commitment. These areas of concern are then used to enliven critical questions of analysis in subsequent chapters.

The Weather Man (1962) chronicles the exploits of the Weather Congress, an entity with complete power over the global climate system,

including the capacity to enact dramatic changes in weather in highly localized ways. As Thomas explains:

> The Weather Congress was the supreme body of Earth, able to bend states, nations, continents, and hemispheres to its will. What dictator, what country, could survive when no drop of rain fell for a year? Or what dictator, what country could survive when blanketed by fifty feet of snow and ice? The Weather Congress could freeze the Congo River or dry up the Amazon. It could flood the Sahara or Tierra del Fuego. It could thaw the tundra, and raise and lower the levels of the ocean at will. And here, in this chamber, all the political decisions had been made, and the chamber seemed to acquire some of the feeling that had been expressed over the last half century, from the stormy early days, to the more settled and reflective present. It was a powerful chamber, and it made its power felt by those who sat in it (Thomas 1992, 148).

The Congress uses a representative system based on population density within fifteen-degree squared tracts. This construct enables just 200 "Councilmen" to put forward requests and vote on a variety of weather manipulation proposals. That these are the two primary storylines that drive the overall narrative arc is quite compelling. The Congress ultimately votes to punish parts of Australia with drought as their actions, which are never outlined, present a clear "challenge to the supreme authority of the Weather Congress over the peoples of the world" (Thomas 1962, 144). Juxtaposing this action with the protagonist's plan to fulfill a seemingly outlandish request—snow in Southern California in July—by one of the inventors of weather manipulation technology, *The Weather Man* illuminates how centralization—both technological and within the context of governance—showcases geoengineering's complicated politics. How

can governance and deployment systems and mechanisms be designed to overcome the pitfalls of centralization? Can geoengineering ever be truly egalitarian? What governance paradigms and models can and might be utilized to support participatory research and, if deemed necessary, deployment? How might others, such as corporations, interface with geoengineering governance structures?

Extinction (2005) chronicles the rise and fall of the ERGIA Corporation, who have the power to control the global climate system from space using a network of satellites. Global warming, however, is still a concern for many as the services of ERGIA are only available at a steep price, and as much of the developing world was unable to fund alternative adaptation strategies, "multitudes of environmental refugees" have made their home on retrofitted ships in the Southern Ocean (Hammond 2005). When Michael Fairfax, the novel's primary protagonist, sets out to represent the world's climate refugees in international litigation against those responsible for climate change, he gets embroiled in a conspiracy over the truth about ERGIA's weather control system, which is weakening the planet's magnetic field and fostering an unimaginable geo-seismic catastrophe[48]. As ERGIA goes to extreme measures to hide the truth,

[48] Geostorm (2017) has a similar plot, although it quickly dissolves into CGI-driven disaster porn. Although the film treads familiar ground, it was the first wide-release major motion picture to employ geoengineering as more than just a minor plot point. Indeed, satellite-based climate engineering, which is broadened to include highly-localized weather manipulation, forms the foundation for the storyline.

Fairfax teams with Dr. Emilia Knight, a Senior Risk Assessment Seismologist at Geohazard Laboratories—a publicly traded company in the business of predicting earthquakes. The sudden increase in unexpected earthquakes causes Geohazard's stock to crash. Accompanying the expansion of the weather derivatives market, which spiked to "$45.24 billion in 2006" following Hurricane Katrina the year before, *Extinction*, depicts a future in which corporations have immense influence, receive little governmental oversight, and have found creatively destructive ways of financializing disaster (Dunning 2011; Grove 2012; Klein 2014).

Expressing his frustration with ERGIA's monopoly, Fairfax exclaims, "'It's as if, after causing global warming in the first place, they're now charging the whole world millions of dollars every day for managing away its effects'" (Hammond 2005). Although the novel takes a familiar turn in championing the-return-of-the-repressed trope, *Extinction* stages a provocative encounter concerning the potentiality for geoengineering and weather-financialization to become an automated function entirely under the control of corporate actants—the neoliberal fantasy *par excellence*. As Hanoch Biran, ERGIA's Director of Corporate Communications explains to visitors at the space station where weather operations are undertaken: "Our perception consultants advised us that tourists don't really want to look at computers, they want to see real people. So we hire actors to play

the parts. All weather trades on the daily spot market have been automated for over twenty years" (Hammond 2005). Given the aforementioned "land grab" for geoengineering patents and the well-documented mega-trend of increasing automation, *Extinction* elucidates the actual and perceptual uncertainties surrounding corporatization. What role will corporate actants play in promoting and sustaining geoengineering proposals? How will other trends, such as automation, impact geoengineered imaginaries? How can the varying motives—public good versus profits—and timelines—financial versus generational—between different actants be remediated?

The Collapse of Western Civilization: A View from the Future (Collapse) emerged out of a request to write a piece on "why we (collectively) were failing to respond adequately" to climate change (Oreskes and Conway 2014, 63). Taking the perspective of a future historian, Collapse's narrator provides an overview of the political and environmental crises of the late 20th and early 21st centuries with an emphasis on "Western Civilization." In sharp contrast too much of the genre, the text wastes little time and effort on narrative and instead focuses on the failures of the past, which are meant to be read as the failures of the present. Recounting the emergence of the International Climate Cooling Engineering Project in 2052 (IAICEP), the narrator explains:

> Sometimes called the Crutzen project after the scientist who first suggested the idea in 2006, projects like this engendered heated public opposition when first proposed in the early twenty-first century but had widespread support by mid-century—from wealthy nations anxious to preserve some semblance of order, from poor nations desperate to see the world do something to address their plight, and from frantic low-lying Pacific Island nations at risk of being submerged by rising sea levels (Oreskes and Conway 2014, 27).

As with other texts in the genre, *Collapse* fictionalizes a serious potentiality: decisions to implement climate engineering might be made under less than ideal conditions, if not duress. In contrast with other cli-fi narratives, *Collapse* relies solely on real-world science to showcase the risks of climate engineering. Following the cessation of IAICEP in 2063 at the request of India due to a disruption of the monsoon cycle, the narrator recounts a litany of horrific impacts brought about by a dramatic and swift increase in global temperatures (IPCC 2013). As previously noted, termination effect, or termination shock as it is sometimes called, reveals the most pressing concern underlying climate engineering: commitment (Jones et al. 2013). What measures can and must be taken to ensure that termination shock will be avoided? Could geoengineering act as a unifier to coalesce divergent actants? Will geoengineering, and specifically SRM, deployment necessitate substantive changes to our contemporary political order?

In illuminating the ethico-political provocations of centralization, corporatization, and commitment, cli-fi speaks to how we might live (and

die) in worlds ravaged by immense climatic change. Although the genre's increasing popularity signifies a perceptual awareness of what might lie ahead, actualizing alternative futures remains the quintessential challenge of life in the Anthropocene. Encapsulating the problem succinctly, Scranton observes, "[…] Civilizations have throughout history marched blindly toward disaster, because humans are wired to believe that tomorrow will be much like today—it is unnatural for us to think that this way of life, this present moment, this order of things is not stable and permanent" (2013). Sounding an awful lot like a futurist, Scranton's impassioned plea resonates with Toffler's call to overcome "presentism" (1990), Dator's "crackpot realism of the present" (2009), and the "tyranny of the present."[49] Clearly, such an undertaking is easier said than done, although cli-fi certainly aids in imagining ethico-political provocations toward alternative possibilities. What might be done to thwart genuine civilizational collapse, however, remains beyond the purview of cli-fi as a genre, although it is always the case that life endures. Truth, as the saying goes, is often far stranger than fiction, especially if geoengineering enthusiasts have anything to say about it.

Conclusion: A litany of imaginaries

I began this chapter by exploring the history of the Anthropocene,

[49] While this aphorism has grown in popularity over the years, it was Cicero, the Roman politician, poet, and orator, who first used this turn of phrase: “The purpose of education is to free the student from the tyranny of the present” (Greene and Lidinsky 2012, 424).

and its related concepts, as a means of complicating the imaginaries surrounding and underlying geoengineering. I then mapped the two major climate engineering proposals—solar radiation management (SRM) and carbon capture and sequestration (CCS)—as well as more boutique ideations, such as glacial geoengineering and marine cloud brightening, to identify the contours of geoengineered imaginaries. As a means of emphasizing issues of scale, I then looked at the practice of cloud seeding, which is widely used but often not included as part of the primary geoengineering debate. This opened up a space to explore a variety of geoengineered imaginaries, including those born from fictive sources. I then used the genre of climate fiction to isolate three dominant themes within the geoengineering debate: centralization, corporatization, and commitment. Returning to the concept of the Anthropocene, it became clear that imagining truly alternative futures is the most difficult but also most necessary act of our historical moment. What might actually be done to thwart collapse, however, remains beyond the purview of cli-fi. Indeed, the Anthropocene debate, scientific discourse and scenarios on SRM and CCS, and cli-fi constitute the litany of geoengineered imaginaries. Although this litany provides a point of entry for geoengineered imaginaries, few, if any, alternatives are suggested—indeed, if there is one thing that unites the aforementioned discourses, it is an air of inevitability.

This leads, then, to the question: what can and might be done to enable alternative imaginaries? Is futures as a discipline and practice equipped to confront such radical potentialities? If it is not, then how might we change it? In this regard, Scranton, who clearly has alliances with the fundamental premises of futures, is again instructive. He reflects:

> We must practice suspending stress-semantic chains of social excitation through critical thought, contemplation, philosophical debate, and posing impertinent questions. […] We must keep renovating and innovating perceptual, affective, and conceptual fields through recombination, remixing, translation, transformation, and play (Scranton 2015, 138).

That Scranton never invokes futures directly has perhaps more to do with academic training than intellectual sympathies, which come to the fore in his writing. Whatever one chooses to call the pull of the now, Scranton's point is quite clear: normal is the problem.

As a means of working toward a play-driven approach for enlivening a politics for geoengineering, I use the next chapter to engage with postnormal times (PNT) to flesh out how futures studies has both succeeded and failed to engender the type of thinking and action needed to navigate the uncertainties surrounding geoengineered imaginaries and futures.

Chapter 3: Postnormal Futures

From global warming to global weirding

Computer modeling of the global climate system has improved greatly over the past few decades, but the map, as the saying goes, is never the territory. The creation of various forecasts and models is the result of a expansive "climate knowledge infrastructure" that was built upon centuries of development within theoretical meteorology, dramatic advancements in computing, and the formation of standards for recording and reporting climatic phenomena (Edwards 2010). This assemblage is embodied, quite literally, in the IPCC, which is a global network of scientists co-created by the World Meteorological Organization and the United Nations. The IPCC's creates a series of reports that outline new understandings of the historic conditions, current data and trends, and forecasts for the future of the global climate system, including scenarios. These scenarios are almost exclusively quantitative and only rarely provide substantive explication. In the past, the IPCC has been accused of being "too conservative" as perceived and recorded changes have outpaced its forecasts (Scherer 2012). Consequently, when IPCC scenarios gesture toward radical potentialities, it is worth noting, especially when such findings are rated "very high confidence." In the IPCC's 2007 report on coastal systems and low-lying regions, one scenario states that an increase in both the frequency and magnitude of extreme weather

could, and very likely will, severely impact the projected “1.8 to 5.2 billion” people living predominantly in East Asia and Africa “by the 2080s” (Nicholls et. al 2007, 317). Should such a potentiality come to pass, it would not be an understatement to say that things, broadly speaking, would get…*weird*.

When one considers the complex dynamics and radical potentialities of global warming, it has been suggested that *global weirding* is perhaps a more fitting, if not striking, moniker for what is happening and what might lie ahead. In order to account for the actual and perceptual impacts of climate change, Hunter Lovins, who co-founded the Rocky Mountain Institute, coined the term, which has subsequently popularized by Thomas Friedman, the impetuous *New York Times* reporter (Friedman 2007). Citing his preference for Lovins' neologism, Friedman explains, “I prefer the term 'global weirding,' because that is what actually happens as global temperatures rise and the climate changes. The weather gets weird. The hots are expected to get hotter, the wets wetter, the dries drier and the most violent storms more numerous” (Friedman 2010). While Friedman is often, and rightly, chided for mixing metaphors and supporting imperial ambitions, Lovins's concept is useful for exploring the dynamics of actual and perceptual change relative to global warming, although global weirding is not without its detractors (Fernández 2011).

As Joseph Romm, a Senior Fellow at the Center for American

Progress, argues, global weirding "simply isn't a serious enough term—it could just as easily be used to describe the world's growing fascination with reality TV (or videos of piano-playing cats or skateboarding dogs)" (Romm 2007). Given the absurdities that have come to define U.S. politics, perhaps Romm might wish to reconsider. Global weirding seems perfectly suited as an imaginary for our current trajectory, and a high-profile climate scientist has turned to the concept as a means of engaging the public. In 2015, Dr. Katherine Hayhoe, an atmospheric scientist at Texas Tech University where she also directs the Climate Science Center, co-created a webseries on YouTube, *Global Weirding: Climate, Politics, and Religion*, with PBS Digital Studios. In the second episode, "Welcome to Global Weirding," Hayhoe lays out a case for believing in climate change, which gives a sense as to her intended audience, although she never provides a clear definition or justification for her employment of the concept. This omission highlights the most impactful aspects of global weirding—it is decidedly nebulous, strikingly intuitive, and, yet, necessitates contextual explication.

As more than just a play on words, global weirding is both a diagnosis and prognosis—a concept at the interstices of the perceptual (ignorance still abounds amongst climate change deniers) and actual (uncertainty about what can and might happen and what the worst could be). There is no grandiose truth claim at the heart of global weirding just

as there is no totalistic framework or metrics for constituting what passes for weird—such an idea can only be understood within a particular context. As a concept intertwined with both actual and perceptual changes, global weirding speaks to an evolving assemblage that, in Deleuzian terms, requires "being attentive to the unknown knocking at the door" (Deleuze and Lapoujade 2007, 346). The inherent uncertainties and ignorance that underlie global weirding are vast, but three stand out in relation to geoengineered imaginaries: (1) increasing technological advancement, dependence, and ubiquity, (2) impending climatic crises accelerated by an overall lack of foresight, and (3) the transnational drive and reach of enthusiasts, such as George. As a concept distinguished from global warming, global weirding speaks directly to the concept of postnormal times—indeed, it points toward the value of the postnormal as a heuristic for contesting and confronting norms, which is essential to futures as a practice.

In this chapter, I situate postnormal times (PNT) as a movement within futures that furthers and expands dissent (Nandy 1996; Sardar 1999a). In the next section, I define futures as “infinite game” whereby a continuous possibility-space is held to intentionally and consciously pluralize the future, which relies on practices and approaches that expand dissent.

Futures: playing a different game

There have been many attempts to define futures studies, which has been couched as an interdisciplinary, multidisciplinary, transdisciplinary, and even un-disciplinary field of inquiry (Bell 1996; Bell 2003; Inayatullah 2003; Moll 2005; Sardar 2006; Sardar 2010a; Sardar 2015b; Gidley 2017). Unsurprisingly, it was Sardar who invoked the notion of futures as *un-disciplinary*, which he contends has to do with how it "consciously rejects the status and state of a discipline while being a fully fledged systematic mode of critical inquiry" (Sardar 2010a, 183). As a practice, futures is actualized by a spectrum of researchers and practitioners, which is to say that it has both struggled with and benefitted from its relative proximity to mainstream academic disciplines, which varies widely according to context[50] (Slaughter 1998; Selin 2014). Such "disciplinary" challenges are due, at least in part, to the imbroglio at the very core of futures: its object of study remains perpetually out of reach (in the literal sense) and continuously actualized in the here and now (in the perceptual sense). For futures to operate effectively amidst and

[50] Arguably, futures has had much greater success integrating with other academic disciplines and mainstreaming itself within higher education in Australia, Finland, Korea, Taiwan, and across parts of Western Europe, although "futures" in each of these localities reflects the personalities and professional allegiances of the teachers, practitioners, and researchers within each "habitus." In recent years, "futures" has become widely used across critical theory, philosophy, political theory, and other disciplines as a sort of placeholder for thinking about multiple possibilities and potentialities, although much, if not most, of these approaches are completely divorced from and seemingly oblivious to futures studies. This is unfortunate as a great deal of the futures literature focuses on practice, specifically what does and does not work in a range of contexts with a diverse array of participants.

perpetuate this tension, it must presence objections to the customary, normal, and projected—in short, futures aims to contest imaginaries in part by deepening, as well as expanding, our sense of self and world.

As Inayatullah contends, "Futures methods […] decolonize the world we think we may want – they challenge our basic concepts. They deconstruct […] as the safety of having others make decisions for one is taken away" (Inayatullah 2008, 6).[51] As Inayatullah proposes, this deconstruction is ingrained within a variety of futures methods and approaches, which serve as analytical and exploratory tools aimed at exploring and complicating our collective possibility-space. In staging provocations toward challenging normative constructs, futures enacts a distinctly political, if not dangerous, game.[52] As encapsulated brilliantly by Nandy, futures is thus best understood as "a game of dissenting visions" (1996, 637). Positing that futures necessitates "dissent from the existing ideas of normality, sanity and objectivity," Nandy emphasizes an otherness toward predominant imaginaries—a form of resistance not predicated on opposition toward a particular future but rather "the" future as singular (1996, 637). As long as possibility endures, Nandy's game, as

[51] Dator appears to have introduced the metaphor of de-colonizing the future (1975). "Decolonization" as a metaphor has been problematized as it merely gestures toward actually processes and practices of liberation from colonial and settler forces and mechanisms. Within the context of futures, Tuck and Yang argue that this phrasing "makes possible a set of evasions, or 'settler moves to innocence', that problematically attempt to reconcile settler guilt and complicity, and rescue settler futurity" (Tuck and Yang 2012, 1). Given this critique, I have ceased using this turn of phrase.

[52] It was Alfred North Whitehead who famously quipped, "It is the business of the future to be dangerous" (1997, 207).

with the future(s) itself, continues to unfold, and in maintaining a possibility-space in perpetuity, futures plays “the” infinite game *par excellence*.[53] As Carse explains, "the purpose of [an infinite] game is to keep it from coming to an end, to keep everyone in play" (Carse 1986, 6-7). This points to why the "s" in futures is of the utmost importance—it signifies an insistence on continuous possibility.[54] Pairing Nandy and Carse, futures continuously plays in and with spaces of possibility by continuously unframing the singular future, which continues to be a prevalent imaginary and haunt futures as a practice.[55] Offering a thorough indictment of how futures continues to be dominated by Euro-American

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[53] As a theoretical and methodological bearing, this project uses Nandy’s game as both metaphor and tactic, and others have taken note of this resonance as well. As Park observes, futures is "an infinite game for it is an ongoing process" (Park 2013).

[54] Andersson’s relays a fascinating history of how tensions over futures (with the s) came to the fore during the formation of the World Futures Studies Federation at the Third World Future Research Congress in 1972. At this meeting, Andersson suggests that it was the event’s Romanian hosts who pushed back against using the “s,” which was due in no small part to the official future enshrined within “party doctrine” (Andersson 2011, 1428). As Dator, who was present at the meeting, recounts: “The participants were an impressively diverse group of futurists from Eastern and Western Europe, the US, and Asia. But the people we knew as futurists in the USSR were somehow not in attendance. Instead, sitting in silence in the corner, smoking endlessly and in general acting as though he were ‘The Communist From Hollywood’s Central Casting,’ was someone from the Soviet Union. He spoke not a word during our meetings. But on the last day of the Conference, when the draft WFSF constitution was being presented to the participants in a plenary session, the Communist From Central Casting jumped to his feet, raced down the parquet-squeaking floor, mounted the stage and (without actually taking his shoes off) did his best imitation of Khrushchev Haranguing the Capitalists: ‘Why do you call this organization the ‘World Futures Studies Federation?’ It is Future, not FutureS. There is only one future: Ours. There are no alternative futures! You must erase the ‘S’ from World Futures Studies Federation and make it properly the World Future Studies Federation, or no socialist country will become a member’” (Dator 2005, 373). Although the “S” became enshrined a short time later, the contentious history of pluralizing futures points toward the primary role of dissent in how the field and its practitioners position what it is that they do and how it is that they do it.

[55] Sardar argues that Western-born forces, namely neoliberal capitalism, project a singular future—one in which it endures *ad infinitum*.

sensibilities, Sardar argues, “The future […] is already an occupied territory whose liberation is the most pressing challenge for the peoples of the non-West if they are to inherit a future made in their own likeness” (Sardar 1999b, 9).[56] Given this tension, it has been suggested that futures should (and perhaps can) not achieve “house-broken respectability” (Nandy 1996, 639). By dissecting, contesting, and enlivening alternative imaginaries, futures is as much, if not more so, an enterprise centered on perceptual versus actual change, although the latter often garners more of the limelight.

Offering a concise formula as to how this game is actualized, Sardar reflects, "In so far as theory and research in futures studies is about ‘unthinkable thoughts’, about new departures and new destinations, it is about dissent" (Sardar 1999a, 139).[57] For Sardar, the unthinkable is not merely that which is taboo but precisely that which is beyond imagining, which points toward the necessity of unframing, which is both

[56] Given the dynamics surrounding the Planktos incident, the deconstruction of geoengineered imaginaries and their subsequent futures is paramount. While the broader futures space continues to reflect, if not reverberate, a variety of forms of privilege, indigenous scholars and practitioners have been and continue to enliven truly decolonial futures. In response to the many and varied challenges of climate change, indigenous futurists have collaborated to put forward futures that “are mutually beneficial and not rooted in racism or competition for dwindling resources” (Goodyear-Kaʻōpua et al.). Within the context of geoengineering, Whyte argues that prospective governance for solar radiation management (SRM) must “articulate Indigenous peoples as sovereign peoples in relation to NGOs, private companies, scientific advisory committees, supranational organizations, as well as federal or state agencies of nation states (2012b, 184).

[57] This passage comes from an Editorial written by Sardar that prefaces a special issue of *Futures* on dissent. Covering a wide range of geographies and imaginaries, this issue features research articles and essays that support the critical role of dissent within the practice of futures.

an art and science. Articulating the contours of this hybridity, Sardar explains:

> In as far as futures studies involves systematic and disciplined, empirical and rational exploration of future possibilities, futures studies is a science. But experimentation is not a possibility in futures studies; so, in that sense, futures studies is not a science. In as far as future studies involves foresight, prospective analysis, creation of visions and images, future studies is an art. It is the art of anticipation based on the science of exploration (Sardar and Masood 2006, 63-64).

It is worth pushing back on Sardar's contention about the impossibility of experimentation.[58] If one highlights the recalcitrant temporality of the future (as a time and place that has yet to come), then such an assessment goes without saying. If, however, one takes seriously the premise that futures is also very much concerned with perceptual change—how the world in its past, present, and future(s) states has been and continues to be imagined—then things become much more complex.[59]

Sardar actually gestures toward experimentation by invoking the infinite game metaphor. Making an explicit connection between futures

[58] It is worth recalling Dator's point about the function of games within and across the social sciences.

[59] Clearly, Sardar knows this. Indeed, he writes elsewhere: "All futures activities, from forecasts to visioning, causal layered analysis to the Millennium Project, have a direct impact on the present: they can change peoples' perceptions, make them aware of dangers and opportunities ahead, motivate them to do specific things, force them to invent or innovate, encourage them to change and adjust, galvanise them into collective social action, paralyse them with fear, empower them, marginalise them, or tell them they and their cultures and belief systems are important or unimportant. So ultimately what really matters is the impact futures studies has now; and its value and quality can only be judged in the present" (2010a, 184).

and Carse's formulation, Sardar argues, "In infinite games there are no set rules; if there are any, their transgression is encouraged. […] The plurality of futures can only be ensured by plurality of dissent […] (Sardar 1999a, 146). Dissent not only comes to the fore through a continuous possibility-space; it is dissent that makes such a space possible.[60] While this dissent cannot be a-political, it is not inherently tied to any ideology—rather, it is centered on unframing. As Inayatullah argues, dissent in futures is about "unofficial knowledge, as truth outside the margins, as truth that cannot be easily comprehended within the gaze of modernity (Inayatullah 1998b, 58). In unframing modernity, which continues to be a predominant imaginary, futures and dissent are symbiotic—and, depending on the context, one may serve as the host for the other. Sardar observes that dissent has become postnormal, which is to say that it is now subject to the forces of complexity, chaos, and contradictions (2010a). Championing a postnormal outlook on all things, Sardar contends, "Everything from economics to international relations, markets to products in local shops, politics to dissent has become postnormal" (2010a, 436). Sardar's bombastic claims about PNT are certainly designed to raise eyebrows, and even he would admit that not everything has become postnormal—indeed, it is precisely the tension between normal systems and processes

[60] Presencing critical futures studies, Slaughter observes that dissent is "one of the responsibilities of a futurist," although he also notes how such a perspectivism might be difficult for practitioners seeking financial stability and disciplinary collegiality (1999, 150).

and postnormal dynamics.

As with other frameworks, PNT requires contextualization and qualification. In the introduction, I invoked Kapoor's observation that PNT conceals a certain Euro-American bias—one that reflects a *dis-ease* with its loss of power and privilege. This critique raises questions about the scope and scale of PNT, and it is worth considering how (and why) PNT does (and does not) situate itself amongst theories of social change. Although Sardar invokes both Khaldun and Toynbee, who theorized the rise and fall of civilizations, they are treated as foibles.[61] In Sardar's 2010 work, there is no substantive engagement with macrohistory, which studies social systems as a means to identify patterns, laws, and the constitutive dynamics of social change (Galtung and Inayatullah 1997; Inayatullah 2017). In a special issue of *Futures* dedicated to critiquing PNT, Gary writes, "Sardar is in good company with macrohistorians who identify transitions by naming eras" (Gary 2011, 148). Given Sardar's emphasis on the necessity of looking back to learn from the past as part of a larger process for imaginings the future(s), his lack of engagement with this school of thought is quite curious. In his 2015 "PNT revisited" article—

[61] Without citing specific arguments or passages of their writings, Sardar does argue that both Khaldun and Toynbee fail to account for the ways with which orthodoxy re-emerges after times of change. Again using the 2008 financial crisis as his point of reference, Sardar agues, "Notice how quickly the financial markets have returned to bad old ways: the recession is nearly over, green shoots are appearing in many locations, and, we are told, we can return to business as usual, shaken but unstirred" (Sardar 2010, 444).

one in which he responds to Kapoor and Gary—he, again, fails to engage with macrohistorical perspectives. This is unfortunate as macrohistorical thinkers, such as Sorokin, would enhance PNT's reach and could help to position it as a fully-fledged theory of social change rather than a disparate collection of concepts, which is how it comes across at present.[62]

Although PNT is not a fully developed theoretical framework, I do find value in its framings, or rather unframings, of certain aspects of key futures concepts and practices. Realizing the limits of PNT as a theoretical construct, I want to situate it within the context of two futures meta-frameworks: Inayatullah's Six Pillars (2008) and the Association of Professional Futurist's Foresight Competency Model (2016). These two approaches were selected as they signify attempts to develop comprehensive and theory-driven frameworks that emphasize practice.

Internal, External, and Ethical

Offering "a new approach to the study of the future," Inayatullah's Six Pillars (6P) offers a comprehensive and critical pathway for enlivening agency toward creating "the world we wish to live in" (Inayatullah 2008). As an assemblage of foundational concepts, 6P presences the used future; the disowned future; alternative futures; alignment with strategy;

[62] Given my former proximity to PNT, I can attest to its nascent state. Sardar and I actually suggest that its development is ongoing in a co-authored paper that introduces the Three Tomorrows method (2016). Sorokin is especially interesting in relation to PNT as he discusses systems in "abnormal" states and emphasizes the inevitability of chaotic collapse at societal scales, which results from fluctuations of various systems, processes, and phenomena (Simpson 1953; Isajiw 1956; Inayatullah 2017).

models of social change; and uses of the future. Interestingly, Inayatullah introduces the idea of a "seventh concept" that is meant make one "present to changing sensitive conditions, allowing futures to emerge" (Inayatullah 2008, 6). These concepts are synthesized into six basic futures questions:

> 1. What do you think the future will be like? What is your prediction? More and more progress and wealth? Wealth for the view? A dramatic technological revolution? Environmental catastrophe? Why?
> 2. Which future are you afraid of? Random acts of violence? Do you think you can transform this future to a desired future? Why or why not?
> 3. What are the hidden assumptions of your predicted future? Are there some taken-for-granted assumptions (about gender, or nature or technology or culture, or . . .)?
> 4. What are some alternatives to your predicted or feared future? If you change some of your assumptions, what alternatives emerge?
> 5. What is your preferred future? Which future do you wish to become reality for yourself or your organization?
> 6. And finally, how might you get there? What steps can you take to move in toward your preferred future? As it says in ancient Buddhist texts, much of the solution to the challenge of life is simply in being pointed in the right direction (Inayatullah 2008, 7).

With the concepts as a theoretical foundation, and using the six questions as "one way to create the future you may desire," the 6P unfolds as a series of activities/practices: mapping, anticipating, timing, deepening, creating alternatives, and transforming (2008, 6). Inayatullah notes that this framework can be used as "theory or in a futures workshop setting" (2008, 7). Enacting this meta-framework can be done using a range of tools and methods, and Inayatullah invokes shared history, the futures

triangle, the futures landscape, emerging issues analysis, the futures wheel, CLA, four-quadrant mapping, "nuts and bolts," various scenario methods, visioning, backcasting, and Galtung's transcend method. Providing examples and even figures to situate how these methods operate within the context of a particular pillar, Inayatullah showcases the importance of practice within the field. Indeed, 6P is fundamentally "a theory of futures thinking that is linked to methods and tools, and developed through praxis" (Inayatullah 2007, 7).

While the aforementioned methods are introduced as operative, there is no discussion of their limits, constraints, and/or their efficacy in relation to specific topics and/or amongst various audiences.[63] In explicating how one might choose to facilitate *creating alternatives*, Inayatullah contends, "Scenarios are the tool *par excellence* of futures studies. They open up the present, contour the range of uncertainty, offer alternatives, and even, better predict" (2008, 15). Why scenarios as predictions would be better is unclear, although it is sometimes the case that they are designed as forecasts.[64] Given the emphasis on practice, it is curious that there is no specific mention of ethics, which is to say that it is not clear how this framework deals with the positionality and, if applicable, the privilege

[63] Take the example of scenarios created with the Australian Government Pharmaceutical Industry Alliance using Schwartz's GBN approach. Given the extensive work of some futurists, including Schwartz, in the private sector, should they be held liable for helping certain organizations engineer futures that sustain a variety of environmental, economic, social, and political injustices? I am extremely thankful to Dr. Sohail Inayatullah for this critical insight.

[64] A more in-depth exploration of scenarios comes later in this chapter.

and/or power of the facilitator (Inayatullah 2008, 6).[65] While Inayatullah's earlier work (1998b) highlights the importance of dissent, there is no direct articulation of this concept within 6P, and this is perhaps due to this framework's explicit focus on preferred futures, which necessitates a modicum of consensus to generate and subsequently act upon.

One thing that stands out about 6P is its decidedly internal focus, and while emerging issues analysis (EIA) is mentioned in the anticipation phase, there is no formal reference to horizon and/or environmental scanning, which makes it unclear where one finds and/or accesses the emerging issues under analysis. If used within a workshop space, how is external content introduced? Inayatullah does argue that EIA "may merely be identifying new technologies that succumb to the hype cycle," which necessitates a "deeper understanding" (Inayatullah 2017, 28). Indeed, the six questions have a decidedly personal feel (What do you think the future will be like? Which future are you afraid of?), which is to say that they focus on the internal—one's percepts about the future(s). Given the centrality of using 6P to "help people recover their agency," this emphasis makes sense (Inayatullah 2008, 4).

Next, I offer a critical reading of the Association of Professional Futurist's (APF) Foresight Competency Model, which presences a more

[65] Inayatullah does invoke the notion of a "no-concept," which is meant to create an awareness of anything that "limits creativity" (2008, 6). This suggests that one might want, or perhaps even need, to mutate, adapt, and/or shift methods, although this is not discussed.

outward focus (actual versus perceptual). Mapping the distinctions between these two meta-frameworks helps to situate further my argument for the utility of postnormal heuristics, specifically with regards to ethics and expanding dissent. The APF was created in 2002 to support the professional development of futurists by focusing on professional excellence. In 2016, the APF released a Foresight Competency Model (FCM), which was constructed by a Professionalization Task Force charged with mapping practices, competencies, and central aspects of foresight.[66] Situated into five tiers, the FCM outlines personal, academic, workplace, technical, and sectoral competencies. Personal focuses on "soft skills" and has much to do with how one approaches foresight as a practice, and this tier includes a mention of abiding by a "professional code of ethics," although no further detail is given and, ostensibly, this has to do with "how" one facilitates such processes and client interactions (APF 2016). As my specific interest lies with how this framework situates the practice of futures, the remainder of my analysis will focus primarily on the technical tier.

Resonating with 6P, the FCM provides a six-step process for practicing foresight: framing, scanning, futuring, visioning, designing, and

[66] Foresight is often used interchangeably with futures, and these terms are not always used synonymously. Sardar argues that foresight implies a singular outcome and remains "most commonly associated with business and bureaucracies" (2010a, 180). This usage reflects a clear bias within the organization, which continues to be dominated by members from Euro-American contexts.

adapting. As one might expect, framing centers on defining, scoping, and contextualizing one's topic or area of focus. It is here that worldview and assumptions are explored, and the APF positions this stage as diagnosing the audience/client. In the scanning phase, one seeks, collects, and analyzes "signals of change," which is tantamount to horizon scanning. In the futuring tier, a "likely" scenario is used as a baseline for crafting "alternative futures or scenarios based on wildcards, ideas, systematically derived alternative projections and images built around key drivers and uncertainties, challenges, opportunities and aspirations" (APF 2016, 13). Given the aforementioned issues of using "wildcards" as a metaphor for emerging issues and the lack of specific methods and/or outcomes for this phase, this tier clearly needs further explication. With that said, futuring is described as "letting go" and "suspending pre-conceived notions" in order to "see the future with fresh eyes" (APF 2016, 13).

In the visioning phase, one moves to craft a preferred future, which, from the APF's view, centers on "goal-setting" and committing to a "strategic direction" (APF 2016, 13). In the designing tier, the process focuses on making the future(s) tangible via prototypes and/or artifacts that make the vision and goals digestible and understandable. Finally, this process concludes with adapting, which is centered not only on communicating but also on building appropriate systems and processes to monitor progress and, if needed, make adjustments to the vision. As with

6P, the APF's FCM provides a comprehensive meta-framework for practicing futurists, but the focus on external factors, which is made explicit in the prominence of the scanning phase, clearly separates the two. That the APF makes mention of an audience/client is also worth noting, although there is no specific reference to priviliege or positionality.

Although both 6P and FCM provide a thorough accounting for how one might construct and carry out a futures and/or foresight process, critical questions concerning practice, specifically surrounding ethics, endure. Clearly, ethical considerations are meant to arise during various parts of both processes, and I do not claim that either approach is a-ethical. In sharp contrast from 6P and FCM, PNT commences from an explicit ethical position, but this is also what problematizes its claim as a fully-fledged "theory."[67] This is not to say that PNT is didactic, quite the contrary; Sardar continuously references "our" (futures, humanity, planet), which presumes commensality—one that might be wishful but remains a constant refrain pointing toward the need for communal processes and practices. In support of this aim, Sardar calls for an "ethical imagination," one that "acknowledges the uncertainty and risks we face and work through complexity and diversity cherishing the virtues we are most in

[67] At the beginning of the next chapter, I invoke Latour's distinction between matters of fact and matters of concern to highlight the limits of objective and fact-driven social science. Furthermore, this explicit ethical positionality is an intentional and conscious affront to the relativism of postmodern approaches and sensibilities.

need of: humility, modesty and accountability" (Sardar 2010b, 444).[68] Aligning with Jasanoff's concept of "technologies of humility," PNT holds a position of dissent not only in relation to "the" future but also within futures itself, and this is perhaps as much a product of Sardar's critical comportment toward the broader futures field as it is his penchant for, and utter delight in, being iconoclastic. In response to his critics and calling attention to PNT's positionality within the field, Sardar reflects:

> On the whole, futurists have avoided big questions (normally seen as the subject of philosophy) and concentrated on analysing trends, horizon scanning, building global models and creating scenarios, visions, images of alternative futures […]. But in postnormal times, when what constitutes economic activity is being questioned, when the body is itself being reshaped, when social relations are being reconfigured, and the very idea of what it means to be human is being transformed, big questions cannot be ignored in futures work (Sardar 2015a, 36).[69]

Geoengineering is certainly a big question—one that not only raises a range of ethico-political considerations but also necessitates an ethical unframing. This, perhaps more than any other reason, is what spurred my interest in applying postnormal heuristics, which is limited to the Menagerie. As with climate change, geoengineering lies at the interstices of actual and perceptual change, and contesting and

[68] As part of the tier on workplace competencies, the APF notes the importance of creative thinking, specifically exhibiting the "capacity for imagination […]," but it makes no mention as to what end (APF 2016, 10).

[69] In specific relation to geoengineering, Sardar is right. In the years following the release of the Royal Society's landmark 2009 report, Few futurists (Cascio 2009; Deudney and Grove 2009; Brand 2010; Hines 2012) took heed of this emerging issue, although weather manipulation and control remained, and remains, a popular imaginary across the broader futures field.

critiquing geoengineered imaginaries requires internal, external, and ethical positionalities. In using postnormal heuristics as one of my theoretical frames, this project commences from an ethical position—one born from a deep-seated dissatisfaction with our collective trajectory and the imaginaries working to obfuscate and diminish a plurality of dissent.[70] As a further means of contextualizing and situating my usage of PNT, I work through the concepts of uncertainty and ignorance, which serve as the forces that shape how futures are envisaged and envisioned.

Uncertainty and Ignorance

For four years, I had a hands-on role in shaping the evolution of PNT and its corresponding method, The Three Tomorrows (3T). Most, if not all, of PNT is explained through examples, which has much to do with Sardar's influence upon CPPFS, its clients, and outputs. One of my earliest engagements with CPPFS was a somewhat impromptu trip to Chicago in May 2013 where Sardar and I began reimagining the futures cone, which graphically renders archetypal futures—or more accurately, maps futures imaginaries. While there have been many versions of the cone, Voros provides one of, if not, the most thoughtful and complete frameworks, as seen in Figure 1 below (2017).

[70] I have always liked the 2004 title of the Howard Zinn documentary: "You can't be neutral on a moving train." I have found the same to be true about objectivity on planets undergoing dramatic climate change.

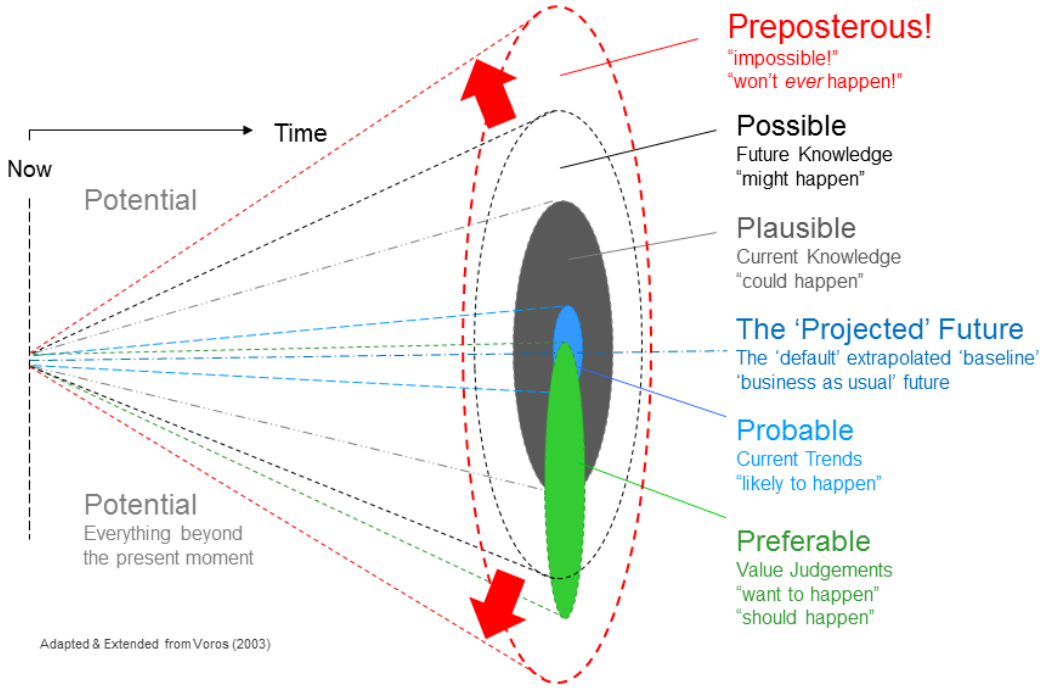

Figure 1: Voros's futures cone

Building on the "standard" cone, which typically includes projected, plausible, probable, and possible, and preferable futures, Voros adds in the preposterous, which, given the dynamics of PNT, is quite apt.[71] Noting the necessity of its inclusion, Voros introduces the concept of the "Dator-Clarke Discontinuity," which emphasizes the importance of identifying and articulating "ridiculous" and "impossible" potentialities (Voros 2017). In moving someone to explore beyond the possible, Voros illuminates the importance of thinking the unthought—hallmarks of Arthur C. Clarke and Jim Dator's collective oeuvre. In moving one to think beyond the

[71] Voros offers a brief history of the cone and specifically mentions the contributions of Amara 1974; Hancock and Bezold 1994; Henchey 1978; and Taylor 1990. Although he adds preposterous, he does not include preventable, which is sometimes included in listing categories (Tiberius 2011; Bell 2017b).

everyday, Voros makes an explicit link between perceptual and actual change. He explains, each category (projected, probable, etc.) signifies "*subjective judgments* about ideas about the future that are *based in the present moment*" (Voros 2017). According to Voros, it is only within the "projected" future that the past makes itself felt, although he does note that once something becomes possible—the Apollo moon landing is the example used—then migration across categories (i.e. from preposterous to plausible) is inevitable. The normalization of formerly preposterous things and events is something that both Sardar and I found quite compelling, and perhaps this is the greatest contribution of Voros's cone. When Sardar and I began to conceptualize a new futures cone as part of crafting a futures method, we felt an overall lack of attentiveness toward the "fuzzy" spaces where normalization occurs. Although it was perhaps never the remit of the futures cone to account for this dynamic, we believed that this process is essential to making sense of how future(s) imaginaries are created, critiqued, and communicated. What is it exactly that happens inside our thinking bodies when we imagine possibilities for the future?

Clearly, the past plays a significant role in how we understand the present and imagine the future(s). Only Taylor's cone takes into consideration the full weight and plasticity of the past, which is critical as

memory literally shapes our ability to imagine what might lay ahead.[72] As Schacter et al. postulate, the parts of our brain associated with episodic memory is "crucially involved in our ability to imagine non-existent events and simulate future happenings" (Schacter et al. 2007, 657). If such a process is a feature rather than a bug of perception/cognition, then any and all futures cones ought to start with the past(s) and present(s)—used in the singular/plural to denote the individual/contextual means by which we sense and subsequently imagine. Here, one can draw a clear resonance with Bergson's notion that our grounding in the present comes from one foot in the past and another in the future (Bergson et al. 2011).

In our cone, contested histories, novel archaeologies, and/or minor narratives are always-already prescenced through the concept of the "manufactured normalcy field" (MNF) (Rao 2012). In situating both the past and present as the starting point of cognition/imagining, we highlight how imaginaries normalize and, by extension, frame our capacity to envision futures, which are further conditioned by uncertainty (clarity or lack thereof about what is and can be known) and ignorance (the universality of imperfect knowledge). As Rao explains, "There is an unexplained cognitive dissonance between changing-reality-as-

[72] Dr. Jake Dunagan's unpublished dissertation contains a rich array of resources on neurofutures, which complicates the technologies and processes used to analyze our thinking bodies, cognition, and the complex processes by which we imagine past, present, and futures (2011). It was through his work and via personal correspondence with Dr. Dunagan that I first encountered research in this area.

experienced and change as imagined, and I don't mean specifics of failed and successful predictions" (Rao 2012).

Rao's seemingly obvious insight is quite compelling and operates as a sort of *anti-future shock*. Even our sense as to what might be possible, however fantastical, is mediated by what we can conceive, which, in some way, is affected by our MNF. Acting as a sort of membrane—an imaginary sustaining, making, and crafting assemblage—the MNF is the primary means by which past and present shape our sense of what is projected, plausible, probable, possible, preferable, and preposterous. Agreeing that the MNF was a sensible, if not the only honest, point of origin for our cone, we sought to represent both uncertainty and ignorance, which emerge from the MNF but also constrain it, as the main forces that shape our capacity to imagine the future(s). Figure 2 (below) renders this by demonstrating the conditioned perspective from which alternative futures can be imagined.

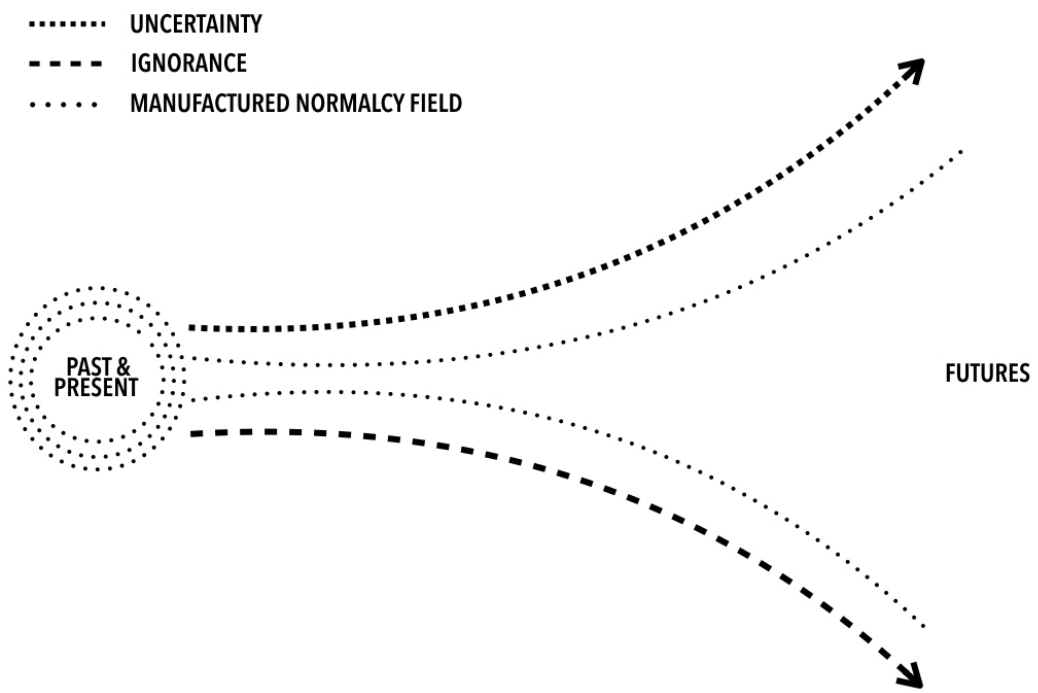

Figure 2: CPPFS basic cone

In PNT, exploring futures is further complicated by the diffuse affects of complexity, chaos, and contradictions, which engenders a feeling that we live in a "time without the confidence that we can return to any past we have known and with no confidence in any path to a desirable, attainable or sustainable future" (Sardar 2010b, 435). In the wake of such ambiguity, it should come as no surprise that nostalgia and xenophobia have come to define electoral politics in a range of contexts—certainty at all costs, as it were. Compounded by the "crackpot realism" and (in many cases literal) "tyranny" of the present, predominant imaginaries (particularly growth-based imaginaries) forge a keyhole from

which to envisage possibilities for what might lie ahead (Dator 2006). Hence, the many and varied challenges of utilizing pre-made scenarios, particularly if they are not part of a broader process of learning and, perhaps most importantly, intentionally combating the constraints of uncertainty and ignorance. How might such a process unfold? In his 2010 provocation, Sardar provides only a trajectory. He explains:

> The kind of futures we imagine beyond postnormal times would depend on the quality of our imagination. Given that our imagination is embedded and limited to our own culture, we will have to unleash a broad spectrum of imaginations from the rich diversity of human cultures and multiple ways of imagining alternatives to conventional, orthodox ways of being and doing (Sardar 2010b, 443).

How might "a broad spectrum of imaginations" explore futures critically and collaboratively? Are there means by which to enhance the quality of our (ethical) imagination? In responding to the above queries, I turn to look at scenarios, which are undoubtedly the futures field's most widely used method for imagining alternatives.

Told you so

In *Inevitable Surprises*, Peter Schwartz, who co-founded the Global Business Network, recounts his participation leading the scenarios team on the Hart-Rudman Commission, which was tasked with forging a new national security strategy for the United States at the dawn of the new millennium. A few months after President George W. Bush's inauguration, the Commission released its report, which identified terrorism as the

greatest threat facing the country. Schwartz recounts, "In one scenario we anticipated terrorists destroying the World Trade Center by crashing airliners into it. Our most urgent recommendation was that the U.S. needed new levels of capability in homeland defense" (Schwartz 2001, 4). To some, such an admission represents the veritable holy grail of foresight, and while having the occasion to say "I told you so" is perhaps the secret delight of many within the broader futures space, the most telling, and important, aspect of Schwartz's anecdote comes in the next paragraph.[73] He explains, "The Commission's work, and other similar efforts by various critical agencies, did not prevent the attacks, but they did contribute to the decisive speed and competence with which the U.S. responded, especially in the first few months" (Schwartz 2001, 4). Schwartz's story highlights what scenarios can (and cannot) do and, perhaps most importantly, how they can be used (and abused).[74]

As the mainstay, if not defining, practice of futures, I employ "scenarios" herein as an umbrella term to encompass tools and methods related to practices of modeling, analysis, and planning (Bishop et al. 2007; Chermack 2004; Masini and Vasquez 2000; Van der Heijden 1996).

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[73] Futures and foresight are not synonymous terms, and my invocation of the latter above is intentional. As a practitioner working predominantly with humanitarian and development agencies and organizations, I found foresight to have a wider currency across a range of contexts, which perhaps speaks to the dearth of academically trained futurists working within this space.

[74] This anecdote also raises a critical question about the ethics of futures and its practitioners, and I return to this question when looking at Shell's longstanding scenario practice.

As noted in the Millennium Project's research methodology guide, scenario is "[…] probably the most abused term in futures […]" (Glenn et al. 2009, 2). Chermack argues that this is due to a deficit of theory, although his analysis centers more on practices and approaches from business and management spheres rather than futures studies (2004b). How and why are scenarios used (and abused)? Can scenarios deliver on the larger mandate of futures as envisioned by Nandy?

There are few organizations more closely associated with scenarios than Royal Dutch Shell. As part of an in-depth review of how scenarios (did and did not) work at the multinational oil giant, Wilkinson and Kupers, who both spent time inside the organization, provide a critical point of entry for thinking through the functionality of scenarios. While the book winds its way through the decades-long history behind Shell's scenarios practice, there is a rather telling passage toward the end of the text. They reflect, "There are no solid examples of Shell anticipating future developments better than other companies, notwithstanding the mythology around the anticipation of the oil crisis in the 1970s—but there are plenty of anecdotes of Shell catching on quickly to changes in market or in culture" (Wilkinson and Kupers 2014). Aligning with Schwartz's sentiment, this intimation captures how scenarios work in a variety of contexts—as part of a broader organizational learning paradigm and, perhaps most importantly, as a means for contesting dominant imaginaries, which

always and only occurs within a particular context.[75]

As a product, scenarios are often targeted at leaders, and Shell is notorious for generating “plausible” scenarios for its leadership team. Pierre Wack, who led the scenarios team from 1971-1981, is credited with creating this emphasis, as well as being the catalyst that drove further adoption of scenarios across the private sector (Chermack 2017). Emphasizing the actual/perceptual divide inherent to Shell’s approach, he argues, "Scenarios deal with two worlds. The world of facts and the world of perceptions. They explore for facts but they aim at perceptions inside the heads of decision makers" (Wack 1985). Echoing Wack, Wilkinson and Kupers contend that scenarios have much more to do with the present, specifically “drawing attention to the role of the future in shaping current priorities and facing immediate challenges” (Wilkinson and Kupers 2014). If scenarios have just as much to do with the present as with the future, is plausibility an appropriate metric? What assumptions underlie the need for plausibility? How do scenarios confront and contest imaginaries?

As a process, some believe that scenarios must focus on “relevance, coherence, likelihood and transparency" (Godet and Roubelat 1996, 169), but others envisage scenarios as “a kind of collectively

[75] Indeed, it is not at all clear that Shell’s scenarios, and the learning that they engendered, was fruitful for the many and varied spaces and place where oil and gas were (and continue to be) extracted—it is likely the case that the opposite it true. Some futures have blood on them.

practiced existentialism" (Ogilvy 1996, 32). Clearly, the latter suggest imaginaries are being questioned. It is perhaps best to think of this spectrum in terms of the amount of *future shock* that an individual or organization can and might be willing to absorb, which has certainly been complicated by PNT (Toffler 1990). Indeed, Ogilvy's framing resonates with how some have responded to the meteoric rise of Trump, who might actually be the best argument for and living embodiment of PNT. In a *New York Times* editorial that reads more as a confessional, Douthat opines, "But one of the vows I took after Trump's stunning political ascent was to refuse to be that surprised again, to refuse to simply laugh at scenarios that seem outlandish or unlikely—because, as they say, that kind of reflexive laughter is how you got Trump" (Douthat 2018).[76] Clearly, it was much more than laughter that ushered in the aegis of Trump, but Douthat's point about the limits of plausibility is duly noted.

There is perhaps no greater affront to the need for plausibility in creating alternative futures scenarios than our all-too-postnormal present, and Trump is merely the latest, although very much a perverse, embodiment of Dator's 2nd Law of the Future, which has become axiomatic within (as well as beyond) the futures field. An updated and expanded

[76] A serendipitous tweet by Dr. Stuart Candy enlightened me to Douthat's piece.

version of Dator's 2nd Law[77], which is worth quoting in full, reads as follows:

> 2. *Any useful idea about the futures should appear to be ridiculous.*
>
> (a) Because new technologies permit new behaviors and values, challenging old beliefs and values that are based on prior technologies, much that will be characteristic of the futures is initially seen as novel and challenging. It typically seems at first obscene, impossible, stupid, "science fiction," ridiculous. Eventually it may become familiar and then utterly normal and "obvious." However, it is unfortunately the case that not all ridiculous ideas are useful—many are indeed ridiculous. Determining beforehand the difference between the two is what makes futures an art as much as a science.
>
> (b) Thus, what is popularly, or even sometimes professionally, considered to be "the most likely future" is often one of the least likely actual futures.
>
> (c) If futurists expect to be useful, they should expect to be ridiculed and for their ideas often to be rejected. Some of their ideas may deserve ridicule and rejection, but even their useful ideas about the futures may also be rejected because they run counter to the "crackpot realism" of the present.
>
> (d) Thus, decision-makers, and the general public, if they wish to consider useful information about the future, should expect it to be unconventional and often shocking, offensive, and seemingly ridiculous. Futurists, however, have the additional burden of making the initially ridiculous idea plausible and actionable by marshaling appropriate evidence and weaving together alternative scenarios of its possible developments (Dator et al. 2015, 135).

Although noted by Dator for decades, the addition of "not all ridiculous ideas are useful" speaks to how scenarios confront both actual and perceptual change. If the primary aim of a futurist is to make an "initially

[77] Additions were made during the writing and editing process for *Mutative Media: Communication Technologies and Power Relations in the Past, Present, and Futures* (Dator et al. 2015).

ridiculous idea plausible," then scenarios must link present and futures in a digestible and concrete way—and this is often, but not always, a contest of believability. Can plausibility be reconciled with Nandy's "game of dissenting visions" and Sardar's "unthinkable thoughts?" Can (and ought) pre-created scenarios carry the full weight of these contentions?

The above queries are what allow futures to position itself within the (social) sciences, but this is also where scenarios can (and sometimes do) fail to contest dominant imaginaries and productively foster dissent. A practice-based example from my participation in the Hawai'i 2060 project encapsulates this point. As part of research process leading up to the event, data on sea-level rise was collected and used to forecast our alternative futures, which were created using the Mānoa School modeling method (Dator 2009). In one scenario, dramatic sea-level rise pushed the islands to adapt radically leading to a sea-based livelihood and economic paradigm. This transformational imagining of the future appeared to receive a positive response from attendees, but a prominent member of the University of Hawai'i's School of Oceanic and Earth Science Technology called into question the efficacy of the approach and overall validity of the exercise. From his perspective, the scenarios were not

merely unthinkable—they were nothing short of irresponsible.[78] If the scenarios were seen as preposterous, this likely says more about the audience—and their perceptions—than the actual scenarios, and others have noted that plausibility is a rather nebulous metric (Ramírez and Selin 2014; Star et al. 2016).

Fast forward to 2014. A follow-up exercise for the Hawai'i 2060 project was organized, and the prominent participant who was previously flustered by the scenarios dramatically altered his tune. Indeed, the expert in question made a point of apologizing for his earlier response as updated forecast models made it clear that what was previously seen as an outlier (i.e. an extreme scenario) was now an expected or projected future.[79] Perceptually speaking, plausibility is a moving target, and one can never know with complete certainty if participants will go along with, and/or truly inhabit, the worlds that have been created for them. In the scenario experience that I facilitated as part of the same event, one of the participants got up and walked out without warning, although his departure was immediately after I began reviewing bio-neurological enhancements for fetuses and babies. Later that day, I actually had a chance to chat with

[78] A recent report, which was actually co-authored by researchers at the University of Hawai'i's School of Oceanic and Earth Science Technology, found that by 2050 the islands could see a dramatic increase in coastal flooding and extreme weather events. Furthermore, the report states that the land area vulnerable to sea-level rise could be double previous estimates (Anderson et al. 2018). Unthinkable indeed.

[79] This shift was relayed to during a conversation with Jim Dator, who attended the 2014 event. As a contributor to the 2011 gathering, I recall a range of reactions to the scenarios, although the prominence of the expert in question made his comments hard to forget.

this participant and found out that one of his children was born with a genetic disorder. I learned two valuable lessons from this project. First and foremost, experience matters just as much as content. If participants cannot, or will not, engage, then the exercise has failed. As such, there must be multiple points of entry, as well as potential exits, to accommodate a range of biases, assumptions, prejudices, and worldviews. Second, be careful what you wish for. Producing an affect via a scenario is (or ought to be) an ethical experiment—one that, regardless of the whether or not the participants read the fine print, can transgress into an affront to one's life in the here and now. Of course, there is no way to design for every possible contingency, so the lesson here harkens to something more dramatic.

As a scenarios practitioner, I have resigned myself not to create scenarios as a product for anyone unless they actively participate in the process. As the Hawai‘i 2060 examples suggest, when pre-created scenarios are presented, even if via experiential means, there is always a possibility that they can and might be rejected for a variety of reasons. In the above context, play was impossible, especially as some of the “experts” would (or rather could) not engage with the possibility space. Clearly, this has much to do with how scenarios can (and cannot) stifle dominant imaginaries but also with the means by which content and form are blended. Finding the proverbial sweet spot is what makes scenarios

an art as much a practice, and this is precisely where experimentation—as a process of engaged, embodied, and collaborative learning—becomes instrumental. This is also where scenario approaches benefit from a range of epistemological frames—inductive, deductive, and abductive.

Given the dynamics of PNT, however, there has never been a more difficult time to undertake such processes, which is perhaps why scenarios have skyrocketed in popularity over the past few decades (Bishop et al. 2007). As a practice for organizational learning, scenarios have become all-too-normal, which speaks to the dynamics of our *all-too-postnormal* present. Living in an age where complexity, chaos, and contradictions have come to shape daily life has made imagining scenarios more complicated, and not just because "the future" arrives sooner than expected. As Sardar and I argue:

> Traditionally, Futures Studies deals with plurality of alternative futures by differentiating between plausible, probable, possible, and preferable futures […]. But what is probable in a world where uncertainty and chaos is the norm? What is plausible in futures dominated by contradictions? […] Do existing scenario modeling methods adequately allow for the requisite pluralism and polylogues, including amongst humans, non- and, un-humans, needed to confront PNT? (Sardar and Sweeney 2016, 2).

In some ways, it seems inevitable that PNT generated a scenario modeling method, particularly one emphasizing the complex interrelations between actual and perceptual change and, perhaps most importantly, the necessity of dissent.

The Three Tomorrows

The 3T scenario modeling method uses a multi-step approach for applying PNT in a workshop setting, specifically a gathering of diverse participants over at least two to three days. A full-length article on 3T was published in 2016, and my overview offers a critical examination about some of the decisions made prior to publication as well as reflections on how this approach was received and used by participants.[80] Typically, participants are provided with a daylong introduction to futures studies on the first day, which culminates in a short primer on PNT. On the morning of day two, participants are run through introductory exercises on the 3C's (contradictions, complexity, and chaos). Analyzing the postnormal dynamics of a specific issue, which participants select, participants work in small groups (between four and six people). During my time at CPPFS, our primary "client" was the International Institute for Islamic Thought (IIIT), so a great deal, if not a complete majority, of the development on 3T was in relation to exploring Muslim (or Islamic) Futures—a topic that Sardar pioneered some thirty years ago (Sardar 1985; Sardar 1987). I believe this is important to note as both Sardar and the participants'

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[80] Given Sardar's history in the field and lengthy tenure as the Editor-in-Chief of *Futures,* our dialogue was heavily influenced by his experiences. Over numerous face-to-face meetings, Sardar and I began to sketch a framework for making PNT operational within a workshop setting. Ultimately, 3T aims to generate alternative futures scenarios that illuminate postnormal potentialities and scenarios beyond PNT. Eventually, Jordi Serra del Pino, a Hawaii alumnus, joined CPPFS and provided essential feedback. Consequently, 3T is itself the product of a broad spectrum of imaginations.

familiarity with the topic, particularly its past and present, allowed for a deeper level of engagement, which is not always the case in workshop settings, especially when technical content is a necessary aspect of the engagement. As one of the main aims of 3T is to promote nonlinear thinking and analysis, it might seem counter-intuitive to have groups utilize a formulaic method, but 3T was designed to have participants critically re-examine and complicate their earlier work, which occurs in later stages of the overall process, which begins by looking at the extended present.

When asked about “the” future, many, if not most, revert to an "extended present" (Valciukas and Bell 2003). Popularized by Elise Boulding, this concept was crafted to emphasize a more embodied, inter-relational, and intergenerational awareness of the connections amongst past, present, and future(s) (Boulding 1990; Inayatullah 1997). In many ways, the extended present functions as an imaginary, which is to say that it is very much contextualized by cultural dynamics, specifically world views concerning time and change. In employing this heuristic, the main challenge becomes moving across, contesting, and complicating perceptual and actuals scales of inquiry—local, national, regional, and global. While each culture may have its own version of an extended present, the legacy of modernity’s extended present cannot (and should not) be underestimated, which is to say that geoengineering as a response to climate change is an artifact of a globalized extended present

imaginary.

Focusing on how to get projections out into the open and as a starting point for a conversation about assumptions and biases about “the” future, the first formal 3T session brings to light assumptions, biases, and projections about one’s extended present. In relation to PNT, participants are asked to focus especially on the contradictions that arise during their analysis. As with any group-based workshop activity, each develops its own metabolism, and some require hands-on facilitation while others work independently. In my experience, groups quickly grasped the concept of the "extended present" and began producing content within minutes. After an hour or so, each group has the opportunity to share their findings with everyone else and answer questions from other participants—a common feature of workshop settings. Depending on the size and duration of the workshop, groups might be asked to synthesize results.

Aside from dealing with the neuro-cognitive challenges of moving participants to think beyond an "extended present," there is another major obstacle, but also requisite step, to engendering futures thinking: images of the future (Polak and Boulding 1973; Dator 1998). From blockbuster Summer movies to science fiction stories to IPCC scenarios, we are inundated by imaginings (Sweeney 2013). Although “images of the future” is a standard within the field, I prefer the more complicated imaginings as it points toward the imaginaries underlying, inspiring, and ultimately

shaping how futures are conceived, perceived, and received. Indeed, the concept of imaginings emphasizes how futures are always-already conditioned. Furthermore, visual metaphors are widely, if not overly, emphasized within futures—none being more obvious or ever-present than the futures, or foresight, cone. Imaginings, on the contrary, opens one up to complex and embodied dynamics by which past, present, and future(s) are framed and unframed.

As a means of confronting, contesting, and complicating various imaginings of the future, the next part of 3T centers on the familiar future(s), which also harkens to Inayatullah's concept of the "used" future (2008, 5). Although used futures are relationally transactional, it is not always the case that the nature of this exchange is equitable, which is to say that the colonization of futures—by direct and indirect means—is perhaps the strongest strain of used futures. From this perspective, choosing the term "familiar" for this horizon points toward a range of meanings. At one level, this horizon centers on common and ever-present imaginaries—from Hollywood films to social media. At another level, familiarity has much to do with our individual perspective and relational context. In a group of mixed participants, one might expect that there exists a wide range of familiar future(s), and the primary aim of this session is to surface and discuss such imaginaries. At another level, a "familiar" refers to a servant spirit or demon who supports the efforts of a

witch/warlock in carrying out his/her magical agenda (Wilby 2005). As such, a "familiar" future is one that operates in the service of some greater force with the express purpose of enhancing certain imaginaries. In this way, the familiar future(s), which is intentionally doubled as a singular/plural concept, speaks to the core tenets of futures studies. Outlining futures as a "broadly participative inquiry into the future," Dator argues that this undertaking centers on "identifying and understanding the many different images of the future which exist, understanding why certain people have certain images rather than others, how their different images of the future lead to specific actions, or inactions, in the present […]" (Dator 1998, 302-303). Linking back to PNT, participants are asked to focus on complexity during their analysis, which, again, goes on for at least an hour.

While it is certainly the case that images of the future can (and must) be found within the extended present, separating the familiar future(s) into its own horizon, and placing an analysis of images of the future after the extended present, creates a space where participants naturally build on their earlier work—simultaneously broadening and deepening their analysis. Again, each group shares their work and takes questions from other participants. Finally, having gone through both the extended present and familiar future(s), participants are asked to imagine unthought futures. As Sardar and I explain, this horizon is "not

unthinkable but rather […] where something always remains *unthought*, which is to say that it is populated with seemingly infinite alternative futures […]" (Sardar and Sweeney 2016, 6). In working to identify unthought futures, participants generate provocations, postnormal potentialities, and radical possibilities for what might lie ahead—easier said than done, of course. In over four years, it was a rarity for even an advanced group to produce a full-fledged scenario, and while this is perhaps due to time constraints, I also feel confident in stating that this is due to the limits of this approach. In this horizon, participants are guided to focus on what can or might lead to chaos, broadly defined.

Emphasizing chaos invariably, but not always, led to dystopic scenarios, which were common amongst many of the workshops with which I facilitated/participated. This points toward a significant challenge for such methods: how to move from critique or analysis to creativity that goes beyond expected impacts or results in polar (either utopic or dystopia) imaginings—a cycle that only new forms of imagination might break (Montuori 2011). As much of CPPFS's work centered on Muslim Futures, it was often the case that "chaos" was defined in relation to Islam, specifically the dissolution or degradation of key Islamic beliefs, principles, and practices. In short, chaos often became equivalent with loss—a breakdown of systemic order. However, chaos is a “natural” feature of various systems—from the global climate system to one’s morning

commute. The value of chaos as a concept lies in how it blends the actual and perceptual—to be blunt, chaos is felt. It is an affect of one's position within a particular context—an attentiveness toward dynamics that are unfolding in unexpected ways. As a means of representing this dynamic, Sardar and I chose to visualize the unthought future(s) as a sort of shockwave, and when seen amidst the other tomorrows on our futures cone, one can easily see how this approach uses a layered analysis to move participants toward creative imaginings. Figure 3 renders all three tomorrows on our futures cone.

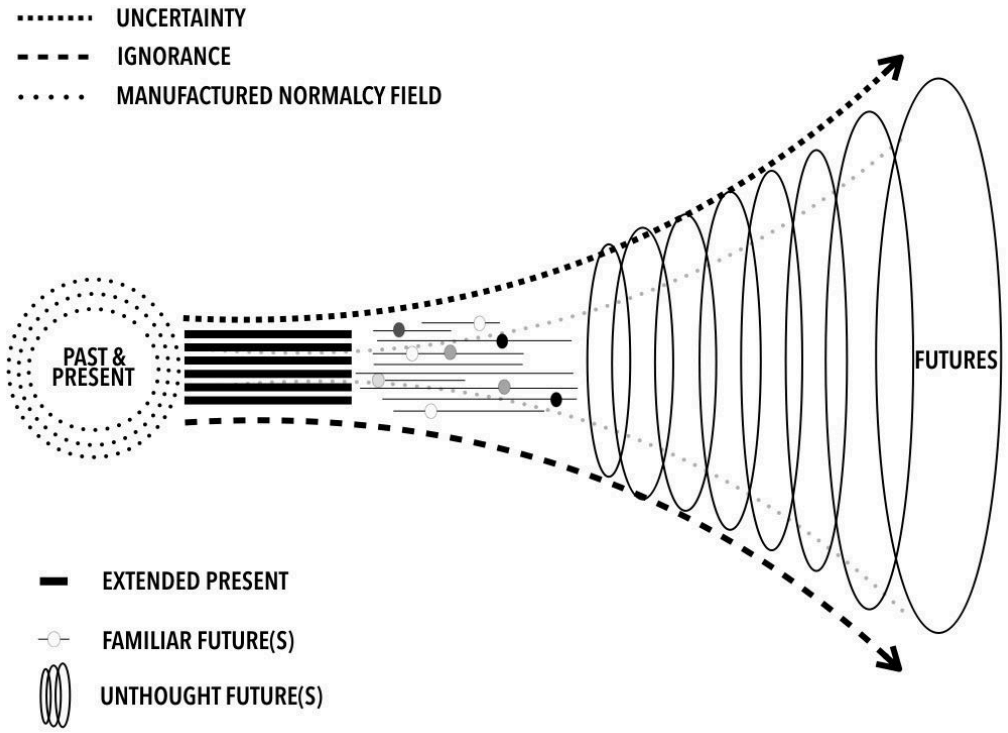

Figure 3: CPPFS cone with 3T

One question that repeatedly came up after participants were

shown this graphic during our workshops was time: does each horizon have a particular timescale or horizon? This issue was a serious point of contention in my exchanges with Sardar, and I eventually agreed to have periods put into the final version of our paper. I was, however, successful in adding in the qualification: "temporal particularities are elastic in relation to the thematic context" (Sardar and Sweeney 2016, 5). This, however, is an understatement, especially when analyzing issues with multi-century and millennia timescales, such as Islam and, as the case may be, geoengineering. Although such considerations are important, especially if one focuses on "actual" change, the means by which 3T operates as a tool for engaging percepts about ongoing, emerging, and potential change is, from my perspective, more significant. This is evident in the final stage of the 3T method.

While Image 3 demonstrates the step-by-step process by which participants move through 3T, it is also a complete facade. Again, the language used is instructive. Selecting "tomorrows" was a conscious decision to emphasize how even phenomena from a seemingly unthought future(s) can emerge swiftly and impact our lives in the here and now, or tomorrow as the case may be. Indeed, a significant aspect of PNT emphasizes the rapidity and unpredictability of change. Furthermore, the theoretical framework underlying 3T, essentially PNT, rejects linear thinking and processes, but just as one must learn simple addition before

moving to trigonometry, exploring each of the tomorrows individually creates a basic structure from which to complicate and re-examine one's analysis. In short, 3T becomes an exercise in contradictions, complexity, and chaos itself as participants often go back and illuminate these dynamics within their previous analysis. Figure 4 (below) renders 3T in its native form, and while it is often the case that some participants anticipate something more, its concealment and subsequent revelation provides a powerful moment that, without question, is often the crux of the workshop. If participants produce nothing tangibly different during the next phase, which involves dissolving the boundaries between the extended present, familiar future(s), and unthought future(s), then the entire process was for naught.

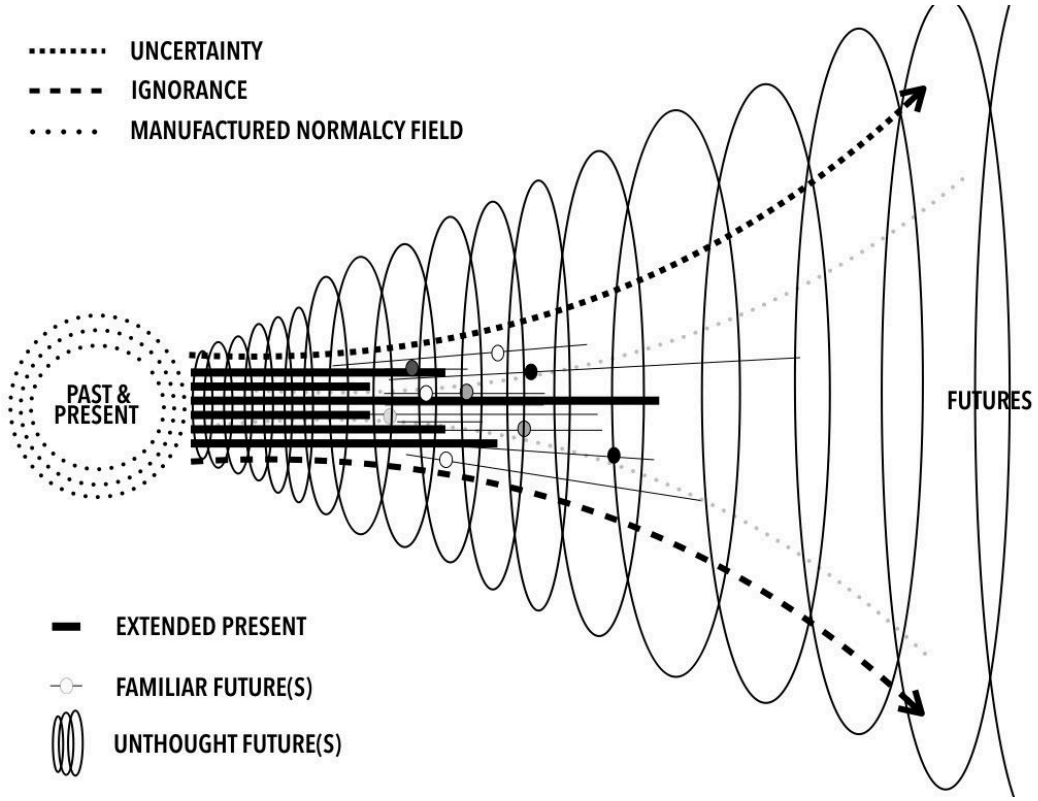

Figure 4: CPPFS cone with nonlinear 3T

While a 3T workshop owes much to its predecessors, especially Jungk and Norbert, Sardar has been consistent in stating that futures in PNT requires something more. In his 2015 update, which also serves as a response piece to PNT critics, he argues:

> […] Futures must now incorporate postnormal landscapes in its purview, methods and analysis. […] It is no longer enough to simply explore a variety of possible futures; we also need to give serious attention to how we are going to navigate the postnormal condition […] (Sardar 2015a, 37).

Clearly, PNT aims to strengthen futures, and Sardar's call to arms ought signals that this approach stems from his analysis of the present as much as the futures field. To date, 3T has been used primarily, although not

exclusively, by students, researchers, and academics with a particular focus on Muslim Futures. Although PNT remains "in development" and given that it was born from postnormal science, it was natural to explore how this approach might be used to engage with geoengineering.

As a practitioner, I take Sardar's above provocation to heart: futures must do more to account for the postnormal dynamics of the present and how this shapes what futures seem plausible, probable, possible, preferable, and even preposterous. But, I have also seen the limits of PNT, and, as with any method, there will always be constraints to what it can and cannot do. Primarily, my concerns are as follows: do participants need a requisite level of technical and/or experiential knowledge to complete the 3T exercises? Are traditional workshop exercises the most democratic, or even efficacious, spaces for such explorations? In the next section, I take up these queries as a means of commencing my overview and critical analysis of the Menagerie, which culminates in my introduction of the concept of trans-subjective positionalities.

The Menagerie of Postnormal Potentialities

In May 2013, the Mauna Loa Observatory reported that atmospheric carbon dioxide reached 400 parts-per-million for the first time in "more than 2.5 million years" (Biello 2013). Putting this disturbingly symbolic, and extreme, milestone into perspective, scientists note that the last time atmospheric carbon levels were this high "the globe's temperature

averaged about 3 degrees C warmer, and sea level lapped coasts 5 meters or more higher," which is to say that the world was a radically different place—one, as it were, absent of humanity (Biello 2013). In a "Hothouse Earth" scenario, however, runaway warming might not be able to be "reversed, steered, or substantially slowed," even by climate engineering (Steffen et al. 2018, 6). Given the radical possibilities enlivened by global weirding, some have proposed interventions that make geoengineering look somewhat tame by comparison. In 2012, a triumvirate composed of bioethicists and philosophers published an article, "Human Engineering and Climate Change," in *Ethics, Policy, & Environment* to much fanfare—academically speaking, as media outlets picked up on its provocative thought experiment. Arguing that "the biomedical modification of humans" should be considered as a means to confront the many and varied challenges of climate change, the authors suggest that enhancing empathy, fostering a pharmacological intolerance to carbon-intensive products like red meat, and/or engineering shorter humans are reasonable and, perhaps, less risky than large-scale climate engineering initiatives (Liao et al. 2012, 207).

Although the authors make it abundantly clear that involuntary human engineering as a course of action is unethical, they believe that willful bioengineering initiatives should be "considered and explored further," especially as this "could make behavioural and market solutions

more likely to succeed" (Liao et al. 2012, 211). If such proposals were ever needed to be considered in any meaningful way, would it be prudent, if not even conscionable, to talk about success? Although this article was intended to raise questions, it leaves some of the most pressing unasked: how can one be attentive to scales (global, regional, national, and local) when considering such thought experiments? How might intergenerational affects be considered? What conditions of possibility could enhance acceptance of such proposals? Are there social and cultural dynamics that might make such potentialities more achievable or even less desirable?

Unfortunately, the authors never discuss how values might shape and/or limit such initiatives, and, perhaps most importantly, how context—specifically the MNF—shapes past, present, and futures imaginaries. Does it not seem contradictory to think that intentionally changing biology would be more palatable to those whose behaviors have already been altered by the threat of climate change? Is it not the case that proposing to create smaller and meat-intolerant humans would be unthinkable to many? Could these types of initiatives produce chaotic results? Chaotic for whom? In this section, I frame my usage of the Menagerie, situate its comportment as a tool for unframing dissent, expand the *black jellyfish* concept, and flesh out the concept of *trans-subjective positionalities*.

To great fanfare, Oxford Dictionaries announced that their Word of

the Year for 2016 was *post-truth* (Oxford Dictionaries 2016). Seeking not to be outdone by their bitter rivals, Merriam-Webster chose *surreal* as its word of the year since "it was looked up significantly more frequently by users in 2016 than it was in previous years, and because there were multiple occasions on which this word was the one clearly driving people to their dictionary" (Merriam Webster 2016). From Brexit to the worsening of the conflict in Syria to the rejection of a landmark peace deal in Colombia to the election of Donald Trump in the United States, it should come as no surprise that such terms were both misunderstood and, yet, ubiquitous in public discourse. That many found the above events—as well as many others—to be surreal and emanating post-truth is demonstrable evidence that PNT, and the disproportions driving it, are not just proliferating but also accelerating. In 2016, such contradictions came home to roost, and chaos made its presence felt. A mere day or two after the Brexit vote Internet search results showed a surge in phrases such as "what is the EU?" suggesting that more than a few people casted ballots without knowing the exact conditions of their choice (Selyukh 2016). When the Director of the FBI, James Comey, announced a new investigation into Hillary Clinton just a few days before the election, the entire narrative—if not the outcome—seemed to change. With the election of Donald Trump as President of the United States of America, a truly postnormal precipice faces the world, especially as references to

climate change were “scrubbed” from the White House website within his first few days in office (McGrath 2017).

For many, if not most, the shocking events unfolding around us are *black elephants*: things not unexpected, although they were viewed as unlikely or even implausible by the many (Gupta 2009). For most, however, 2016—and its fallout—was a time of *black swans*: events and phenomena that seemed highly improbable, at least in part, because they were beyond our perceptual capacity (Taleb 2007). While black elephants are literally “in the room,” black swans are always beyond our purview, until, that is, they arrive and change how we see and understand the world. Both concepts are popular across the broader futures space, and both were integral aspects of PNT’s development.

The aim of differentiating between black elephants and black swans has little to do with getting the “right” answer; rather, it has everything to do with reflecting on how one normalizes and perceives such phenomena. Our individual (and collective) MNF filters our view of the world and often leaves us with shallow justifications for complex events and phenomena. As such, one person’s black elephant can and might be another’s black swan; and yet, neither concept provides a means to explain the bursts of awareness and chaos that characterize our experience of PNT. To bridge this gap, I originally crafted the concept of the *black jellyfish*—a metaphor to describe the sensational weirding of our complex world; the accelerating

chaos of disparate forces coming together to disrupt various systems; the escalating events and phenomena that thrive off positive feedback to become inescapable facets of our daily life. Were it not for my time in Hawai'i, I am not sure that such examples and this specific metaphor would have come to mind, and at one point, there were serious discussions about using puffins as a substitute, but I digress.[81]

One need only look to the recent past to see that black jellyfish are now constitutive of life in PNT. The genesis of the black jellyfish concept comes, at least in part, from the recalcitrant nature of these mindless invertebrates. As Gershwin explains, "Jellyfish are among the world's most successful organisms, having survived freezes, thaws, superheated conditions, shifting and rearranging of continents, mass extinctions, meteor strikes, predators, competitors, and even man" (Gershwin 2013). In sum, they are far better suited to a globally warmed world. As noted in chapter one, jellyfish blooms have wreaked havoc on sporting events, energy facilities, naval vessels, and fishing economies around the world. Blooms, as it were, are difficult, but not impossible, to forecast, and as they have the potential to create chaos, they seemed like an apt metaphor to capture this aspect of PNT. While the negative aspects of jellyfish blooms have been highly publicized, it is perhaps the case that not

[81] In California and elsewhere, puffins began dying off in droves due to the effects of climate change (Graham 2016). While this example points toward feedback loops, it ultimately fails to capture the intended scope and scale of chaos within PNT.

everyone looks at proliferating blooms with distaste, literally speaking. In East and Southeast Asia, jellyfish have been a staple part of various cuisines, and some have suggested that other contexts, specifically those with tastes for carbon-intensive products, should reorient their palates (Duggins 2017; Lutrario 2017). Deemed "the perfect snack for the anthropocene," some European chefs are beginning to take notice of the invertebrates and create new offerings for their patrons (Vincent 2017).

Sensing and anticipating social, cultural, political, economic, and even ecological black jellyfish lies at the heart of PNT and practice. In order to comprehend these phenomena, one must first come to understand the two attributes of black jellyfish—escalation and sensation. The Arab Spring. Occupy. Black Lives Matter. What do all of these phenomena have in common? They began as small, localized events and rapidly escalated into much more. Futures has long postulated that prediction is a fool's gambit and ultimately anathema to the ethos of foresight as a practice for generating insights by imagining alternative and preferred possibilities. In PNT, the urge to predict is even more prominent as the interconnected forces of uncertainty and ignorance escalate a desire for simple answers (often from the past) to complex issues (including those that lie ahead). Trump's "Make America Great Again" mantra encapsulates this dynamic. In a world of complexity, chaos, and contradictions, it is natural to seek black and white answers to questions

firmly within the greyness of our contemporary age. In many cases, seemingly "simple" solutions increasingly do not work, and they often exacerbate the problem and produce a host of new threats, shocks, and disruptions—geoengineering enthusiasts take note. Take the proposals by lawmakers in five states in America to limit the public's capacity to protest peacefully (Woodman 2017). Clearly, these initiatives are highly politicized, which is also to say polarized, actions meant to dissuade organized movements such as Black Lives Matters and those seeking to thwart the Dakota Access oil pipeline from voicing opposition. Although it is certainly possible that they might limit direct actions in the short term, their efficacy for stemming resistance—as well as dealing with the root causes of political opposition—is, at best, miniscule. Indeed, what these measures point toward is the second aspect of black jellyfish: sensation.

On Friday, January 27, 2017, Trump penned an executive order that banned all refugees for 120 days (a direct violation of the Geneva Convention), halted entry for anyone from Syria, and barred anyone from six other countries: Iran, Iraq, Sudan, Libya, Somalia and Yemen (Sherlock 2017). What is clear about Trump's (unconstitutional) order is that it was meant to be an exercise in sensation—a tactic meant to stun. Although Trump campaigned on a platform proffering a complete ban on Muslims entering the US, this modified proposal, albeit equally as horrific, seems to have been generated solely to appease his base. In a lengthy,

and widely shared, post on Facebook, Dr. Heather Richardson, a Professor of History at Boston College, called the Muslim Ban a “shock event” and noted that such phenomena “depends on speed and chaos because it requires knee-jerk reactions so that people divide along established lines" (Richardson 2017). Although the ban was upheld by the U.S. Supreme Court, Justice Sotomayor and Ginsberg's dissent provides further insight into the intent of this tactic. They observe that "Trump’s failure to correct the reasonable perception of his apparent hostility toward the Islamic faith," which was evident in numerous statements made during his campaign, suggests that the ban has more to do with a "discriminatory animus against Islam and its followers" than national security (Sotomayor and Ginsburg 2018). The weaponization of this affect has been a convenient, but not entirely effective, distraction from Trump's various (and ongoing) legal woes, which some believe might result in his impeachment—a potential black jellyfish whose effects are certain to delight as well as perhaps disgust portions of the American electorate. Could understanding such a potentiality from divergent perspectives shed any additional light on potential impacts? Seeing and understanding a black jellyfish from divergent perspectives, which might actually entail thinking about it as a black elephant or black swan, is where the Menagerie excels can and, perhaps most importantly, is what gives rise to its most enduring attribute.

As more than just an exercise in exploring potentialities, the Menagerie can (and might) function, in resonance with Nandy's formulation, as a game *for* dissenting visions. In this game, there is always an outside, or rather inside, which is to say that there is no (and can never be any) such thing as a universal black elephant, black swan, or black jellyfish—each only makes sense within a particular context and from a particular subject position. In short, the Menagerie is an exercise in unframing dissent. As an experimental mode of inquiry, the Menagerie is *trans-subjective*. As much an ontological axiom as epistemological unframing, the Menagerie enacted by and through play facilitates an empathic and speculative engagement with unseen, unheard, and unspoken positionalities.[82] In this way, the Menagerie calls attention to an ethics that is increasingly becoming necessary in our *all-too-postnormal* age. Writing about possibilities beyond the Anthropocene, Zylinska argues that an "ethics of expanded obligations becomes a way of taking responsibility, by the human, for various sorts of thickenings of the universe, across different scales, and of responding to the tangled mesh

[82] This formulation leans heavily on the work of Spivak, whose groundbreaking work in subaltern studies confronts the “epistemic violence” in representationalist politics and discourse (1988, 24). Indeed, this schema eschews representation in favor of experimental unframings. The Menagerie is not meant as a substitute for balanced engagements that take into consideration gender, ethnicity, and other ways of supporting and facilitating diversity, quite the opposite. The Menagerie is a means to explore what subject positions must be understood and sought out.

of everyday connections and relations" (2014, 17).[83] Mandating an openness toward alternative imaginings driven by disparate ethico-political framings, the Menagerie becomes a means to realize Sardar's call for an "ethical imagination" (Sardar 2010b, 444).

In seeking to conceptualize what I find most efficacious about the Menagerie as a tool for shared exploration, there are clear resonances with both "action research" (Inayatullah 2002; Ramos 2006) and "collective intelligence," which are processes of collaborative exploration (Facer 2011; Miller 2007). Indeed, the sentiments underlying my preference for the Menagerie stems from a practice-based bias toward participatory and engaging processes by which learning, and futures in particular, can and must be undertaken toward critical and reflective engagement with truly postnormal potentialities. It is certainly the case that such approaches have become more commonplace across the broader futures space, and a new generation of scholars and practitioners are doing their utmost to shift how futurists unframe what might lie ahead. As Candy and Dunagan observe, "a central challenge, perhaps indeed *the* central challenge, for the next generation of foresight practitioners will have less to do with generating and broadcasting ideas about the future, than it will have to do

[83] This framing resonates with neohumanism, which emphasizes "love and devotion for all, inanimate and animate, beings of the universe" (Inayatullah et al. 3). Whereas neohumanism embraces spiritual traditions, Zylinska's ethics is based on a staunchly materialist perspectivism, which is born from a reaction against modernist and postmodern sensibilities about scientific inquiry and practice. I am thankful to Dr. Sohail Inayatullah for recommending this connection and distinction.

with *designing circumstances or situations in which the collective intelligence and imagination of a community can come forth*" (2016, 15). Futurists must play a new game—one where form is as important as content. Supporting Candy and Dunagan's contention, Love observes that the very future of futures depends on taking into consideration the affect of generations who have "grown up playing with scenarios in the various shared worlds of computer, video and online games" (Love 2009, 153). From this perspective, playful modalities ought to be seen as a necessity.

Having witnessed firsthand how participants use the Menagerie as an essential part of their analysis, I saw this framework produce a similar, yet not always constant, affect. In discussing, and in many cases hotly debating, a particular issue or impact as an elephant, swan, or jellyfish, participants necessarily revealed contextual particularities and articulated divergent subject positions. In simple terms, this was often vocalized as follows: I see "X" as a black elephant for "Y" because of "Z." If black elephants signify contradictions, black swans represent complexity, and black jellyfish symbolize chaos, then an absolutely critical query is implicit within each: for whom? Contradictions, complexity, and chaos for whom? Contradictions, complexity, and chaos in what context? In creating a space for continuous discontinuity, the Menagerie enacts one of the core tenets of futures. As Sardar observes, "Futures studies need to be sceptical of simple, one-dimensional solutions to wicked problems as well

as of dominant ideas, projections, predictions, forecasts and notions of truth to ensure that the future is not foreclosed and colonised by a single culture" (Sardar 2010a, 183). In expanding dissent, the Menagerie aims to create a space for the unseen, the unheard, and the unspoken, and in the next chapter I show how this dynamic is heightened and enhanced further through the modality of play.

Conclusion: Normal versus postnormal worldviews

I began this chapter by looking at the shift from global warming to global weirding, which setup my usage of postnormal heuristics. I then defined futures as a practice for expanding dissent and engaged with two meta-frameworks to contextualize my usage of PNT as an approach for expanding dissent. I then looked at scenarios as an art and practice. Using the both textual and experiential research, I explored the challenges in using plausibility as a metric for crafting and communicating scenarios as well as the limits of pre-created scenarios in a workshop setting. I then turned to PNT and relayed the creation narrative of the Three Tomorrows method, which provided a basis for my invocation of the Menagerie. Finally, I fleshed out the black jellyfish concept and positioned the Menagerie as a conduit for invoking divergent perspectives through the modality of play—what I call *trans-subjective positionalities*.

Ultimately, the shift from global warming to global weirding highlights the difference in worldview between those championing "plausible"

scenarios and imaginings enlivened via postnormal heuristics. Furthermore, a postnormal worldview stakes out an explicit ethical positionality—one that critically engages with complexity, contradictions, and the potentiality for chaos. In the next chapter, I extend this distinction by engaging with Latour's distinction between matters of fact and matters of concern, which shapes how I envisage games as a means of play-based experimentation. I then setup my specific take on games before presenting two "case studies." Finally, I think through how play-driven approaches can be used to further enhance the efficacy of the Menagerie.

Chapter 4: Practicing Play

Facts and concerns

> *Philosophy must be realist because its mandate is to unlock the structure of the world itself; it must be weird because reality is weird.* - Graham Harman (2008, 4).

Ioane Teitiota is the world's first official climate refugee, at least he was supposed to be. The High Court of New Zealand's rejected his petition for asylum, and he was actually deported for overstaying his visa in late 2015. Teitiota's family, including his three children born in New Zealand, have roots in Kiribati, which is the proverbial canary-in-the-coal-mine for sea-level rise. According to some forecasts, Kiribati will be mostly consumed by the Pacific Ocean by the end of the century (or perhaps even sooner) (Wyett 2014). In anticipation of this seeming inevitability, the government of Kiribati purchased land on Fiji in preparation for when the waters rise, which some argue was just a publicity stunt to raise awareness, although the court did note that Teitiota's government was taking steps to ensure that its citizens were shielded from the effects of climate change (Ho 2016). While nearly everyone involved in this landmark case claimed to be sympathetic to Teitiota's plight, the ruling sheds light on both the facts and concerns of our life in an age of *global weirding*.

Using the U.N.'s Refugee Convention, which was passed in 1951 and amended in 1967, as a guide, the High Court decided, "'Persecution'

is not defined in the Refugee Convention but clearly encompasses well founded fears to life or freedom on a convention ground, some form of serious harm, or serious violations of civil or human rights" (Priestley 2013). Although Teitiota's petition specifically cited the pressures of over-population and sea-level-rise, the High Court ultimately did not see fit to alter the scope of the Refugee Convention, which is to say that perhaps the court did not want to set a legal precedent that might open the floodgates, so to speak, for those wanting refuge from both the actual effects of global warming and the perceptual affects of global weirding. Indeed, it is not clear that the court was equipped even to make such a distinction. Simply put, Teitiota's concerns were not "factual" enough to change the conditions of possibility for what does and does not merit refugee status, at least from the court's view. Rejecting the specific claim that a "general worldwide human agency" was sufficient for altering the refugee convention, the High Court observed, "this requirement of some form of human agency does not mean that environmental degradation, whether associated with climate change or not, can never create pathways into the Refugee Convention or protected person jurisdiction" (Priestley 2013). In denying Teitiota's petition, the court actually admitted to the dire consequences of global warming, an undeniable fact, but saw perceptual, particularly generational, concerns as insufficient—in short, the court denied global weirding. In PNT, however, both facts and concerns can

change swiftly—imaginaries too. With the election of a new Prime Minister and governing party who appear to be more sympathetic to the plight of climate refugees, discussions about special visas are now underway (Anderson 2017). In the High Court's ruling, they coined a new term, "sociological refugee," to refer to Teitiota since he was seeking only to "better his or her life by escaping the perceived results of climate change" (Priestley 2013). In deeming Teitiota a "sociological refugee," the court was both *realist* and *weird* in using a term not found in any legal lexicon. What led the court to use such an odd turn of phrase in handing down its high-profile ruling?

Offering a means to understand and complicate the court's decision, Latour's distinction between *matters of fact* and *matters of concern* provides a point of entry for thinking through the imaginaries underlying such events, which are only likely to proliferate in PNT. Channeling Whitehead, whose work has been highly influential within the materialist turn, Latour explains, "A matter of concern is what happens to a matter of fact when you add to it its whole scenography, much like you would do by shifting your attention from the stage to the whole machinery of a theatre" (Latour 2008, 39). The court certainly did not shift its focus to the field, and some have noted that "climate refugee" is a category for which the 1967 Convention actually provides no legal standing (Apap 2018; Jefferies et al. 2018). Although prediction is a fool's game, it is safe to say that this

will change in the very near future.

Latour's thought has been quite prescient, and it must be noted that his 2004 opus, *Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern*, was born during the tenure of George W. Bush, whose plain-spoken and purported *matter-of-fact* style befuddled many.[84] Confronting the harsh realities about what a certain type of critical perspectivism has accomplished, Latour offers a confession—or, perhaps more accurately, a *mea culpa*. He intimates:

> My argument is that a certain form of critical spirit has sent us down the wrong path, encouraging us to fight the wrong enemies and, worst of all, to be considered as friends by the wrong sort of allies because of a little mistake in the definition of its main target. […] The mistake we made, the mistake I made, was to believe that there was no efficient way to criticize matters of fact except by moving *away* from them and directing one's attention *toward* the conditions that made them possible. […] Reality is not defined by matters of fact. Matters of fact are not all that is given in experience (2004, 231-232).

For the High Court of New Zealand, Teitiota's case points toward a new normal—one that few seem willing and prepared to confront. In PNT, it is certainly the case that values are often in dispute and facts are uncertain, but Teitiota's case points toward something more. In targeting the interstices of ignorance and uncertainty, Latour's object-oriented ontology (OOO) confronts and contests critical theory itself.

Under the aegis of postmodernity, Truth (intentionally with a capital

[84] Interestingly, it was W. Bush's father, former President George H. W. Bush, who famously declared on the 1988 campaign trail, "I'll never apologize for the United States of America. Ever! I don't care what the facts are" (CSpanClassics 2010).

T) was torn asunder (Nietzsche). Narratives of various scope and scale were critically and thoughtfully deconstructed (Lyotard). All things were texts whose meanings require excavation (Derrida). While this undertaking shed light on innumerable ideological apparatuses (Althusser), power mechanisms (Foucault), and assemblages (Deleuze and Guattari), the intellectual tools of our liberation seem to have made their way into the wrong hands. Indeed, some have recently argued that Trump, who seems to delight, if not outright flourish, in the rotting corpse of Truth (again, intentionally with a capital T), owes a debt to the postmodern condition (Heer 2017; Kakutani 2018). While Trump is certainly an embodiment of Latour's worst fears, it is essential to distinguish between the banal, yet overtly fascistic, relativism of the "Make America Great Again" crowd and the trans-subjective positionalities inherent within new materialist approaches (Bennett 2010; Coole and Frost 2010; Ennis 2012). In this reinvigorated realist metaphysics, *objects* are constellations, *things* are networks, and *criticism* creates. As Latour opines:

> The critic is not the one who debunks, but the one who assembles. The critic is not the one who lifts the rugs from under the feet of the naïve believers, but the one who offers the participants arenas in which to gather. […] The practical problem we face, if we try to go that new route, is to associate the word *criticism* with a whole set of new positive metaphors, gestures, attitudes, knee-jerk reactions, habits of thoughts (Latour 2004, 246-247).

Ultimately, the transition from *matters of fact* to *matters of concern* is an

ontological shift that beckons engagement with both actual (realist) and perceptual (speculative) contexts. Extending this insight to futures studies, critical approaches can, and must, explore the diffuse *matters of concerns* that constrict, contest, and create future(s) imaginaries.[85]

Proffering an "actor-network theory" (ANT) whereby all things are interconnected, Latour's propositions rest on an absolute empiricism—an axiomatic strategy for engaging the sociality of things within our *all-too-postnormal* world. As one might expect, Latour is not without his critics. Harman argues that Latour's radical sociality simply goes too far, as he reduces an object *only* to its effects—in short, whatever it "modifies, transforms, perturbs, or creates" (Harman 2011). There is certainly a danger in making objects, including humans, purely transactional, and within ANT, it makes little sense to speak of "agency," at least in the traditional sense. From this purview, one must speak of *actants* rather than actors—processes of *becoming* rather than static *beings*.

My specific interest in this line of thought stems from a desire to foster trans-subjective positionalities, which must include a range of human and non-human subject positions, and later in this chapter I begin to explore how such a proposition might be actualized and integrated in a game designed to explore geoengineered futures. Clearly, the High Court

[85] Arguably, this insight lies at the heart of work of Inayatullah and others who presence the necessity to deepen and expand one's understanding of the future(s) using narrative, myth, and metaphor, and as such practitioners assemble arenas where new stories can and might emerge, they are critically creative, in the Latourian sense.

of New Zealand appealed to a radically different, albeit all-too-familiar, ontology in reaching its decision. Teitiota's claim, then, ought to be seen as more than just a legal case—it was nothing short of a metaphysical showdown. How might such a rift be mediated? How does such a dynamic affect geoengineered imaginaries? Speculative, materialist, and realist approaches raise some interesting potentialities, specifically to expand ethico-political horizons, which can inform, if not shape, how we might begin to govern geoengineering, as well as how ignorance and uncertainties surrounding centralization, corporatization, and commitment might be productively navigated.

In the next section, I provide a brief overview of how my employment of the modality of play syncs with the charge of Latour's critic. I then reflect on two engagements that I designed and facilitated using futures games. Finally, I close this chapter by thinking through how the Menagerie might be enhanced through play.

Play as modality

Play is preparation for the future.
- Karl Groos, *The Play of Man* (2015)

As the constitutive feature of games, play is a rather complex modality to distill, although many attempts have been made. Foremost amongst theories of play is Huizinga's concept of *homo ludens*. Arguing that *homo sapiens*—humans as thinkers—is too modernist and

overemphasizes our rational faculties, Huizinga contends that play is constitutive to our very being-in-the-world. Situating play as a cultural phenomenon, Huizinga presences play as freedom incarnate—an activity derived from our inherent sociality. The concept of *homo ludens*—humans as players—positions play as a universal, yet socially constructed, enterprise.[86] Cutting across contexts and cultures, Huizinga presences play as that which always exists beyond the normal. Play, then, is a "stepping out of 'real' life into a temporary sphere of activity with a disposition all of its own," Huizinga invokes the importance of possibility (Huizinga 1949, 8). As such, play becomes a modality of pure possibility—a means to realize the infinite game that lies beyond the normal.

Centuries before Huizinga, Kant noted that beauty arises from the "free play" of the imagination—a state of cognitive possibility whereby subjective judgments (i.e. what is and is not beautiful) are enacted (Rundell 2016). Although Kant's usage of "play" is decidedly metaphoric, his observation points toward the mercurial nature of the epistemological process that play out, so to speak, in forming aesthetic judgments. Might the same insight be extended to play? Why is it that we like some games

[86] Interestingly, Huizinga makes an explicit linkage between politics and play, if only to reinforce how the latter underlies and permeates many, if not most, of our social institutions. He argues, "Politics are and have always been something of a game of chance; we have only to think of the challenges, the provocations, the threats and denunciations to realize that war and the policies leading up to it are always, in the nature of things, a gamble […]" (Huizinga 1949, 210).

and not others? What is it that entices play? Explicating the epistemological as well as ontological aspects of play from a Deleuzian perspective, Colman contends:

> Play is productive and destructive of existing categories of normativity; play messes with epistemologies. Play is essential for healthful mental and physical life, providing as it does an intensive concentration upon singular, and not routine task, requiring team as well as individual participation (Colman 2012, 251).

As Colman argues, play unframes our sense of things. For the purposes of this project, play is a deployed as a modality for *un-framing*—a reconfiguring of one's sense and positionality toward present and future(s) potentialities.

Picking up on Huizinga's framing of play as a primordial activity beyond one's normal existence, Caillois provides a more nuanced take—one that introduces a six-part definition. First, play is free; it is not obligatory. Second, play is defined by agreed upon limits or rules. Third, play is uncertain—one cannot know the result beforehand, and any pre-knowledge of outcomes constitutes "foul play." Fourth, play is immaterial—it offers nothing but the act itself. Fifth, play must have rules—some semblance of order and/or structure. Sixth, play centers on make-believe—a creative act of imagining that extends beyond the everyday. As with Huizinga, Caillois aims to essentialize play, although the latter is far more attentive to its various forms and manifestations, which is to say that play has divergent modalities. For Caillois, play has

forms that cut across cultures and contexts: competition, chance, mimicry, and vertigo. With the last two framings, Caillois differentiates himself from Huizinga and illuminates how play can foment a liminal space—a possibility-space *par excellence*. For Caillois, these forms of play necessitate an imagining of one's self as other whereby one might "escape the tyranny of […] ordinary perception" (Caillois and Barash 2001, 44). Play as eternally outside—as freedom from the normal—dominates much of the theoretical terrain, although there are those who push back on this contention.

Rather than associating play with absolute freedom and flights of fancy, Bogost contends, "Play is the act of manipulating something that doesn't dictate all of its capacities in advance, but that limits its capacities through focus and exclusion" (Bogost 2016, 92). For Bogost, play is that which tests the borders and boundaries of a designed structure, and this points toward its enduring draw. Sounding as if play is merely making the most out of a bad situation, Bogost makes an explicit link between novelty and the myriad complexities associated with playing something. Highlighting the primary affect of play as an activity, he explains, "Fun is not only delight in success, but also the panic of uncertainty, the agony of failure. […] There facing the world's stark truth, we either throw up our hands in disgust or dread—or we persist and discover something new" (Bogost 2016, 81). Here Bogost makes an interesting observation: the

joy of play comes not from the product (i.e. winning) but from the process. Within the possibility-space, then, play finds its truest expression, and while there is certainly more than one way to have fun, this affect cannot exist without possibility.

In any situation and context in which I have had to defend my employment of playful approaches, and there have been a few, I have always found in interesting, albeit unsurprising, that there exists a common, although not universal, sense that enjoyment might act to diminish the robustness and validity of the overall enterprise. While research suggests that increased levels of dopamine and endorphins, which result from positive and joyful experiences, promote learning, enjoyment is often a tertiary, if that, outcome (Willis 2006). If the aim of the critic, as Latour argues, is to convene arenas for participants to gather, can and might a game be such a space? In what comes across as a moment of sanguine reflexivity, Latour intimates, "[…] the resource of fiction can bring—through the use of counterfactual history, thought experiments, and 'scientifiction'—the solid objects of today into the fluid states where their connections with humans may make sense. Here again, sociologists have a lot to learn from artists" (Latour 2005, 82). This is perhaps also where futurists have a lot to learn from gamers. While games are fictional in the sense that they are artifacts of imagination, it has already been established that such approaches can (and do) have

serious aims and outcomes. Within the context of futures, Inayatullah has shown how play (via gaming) “allows not just for an understanding of the deep structures of power, but creates the possibility of new forms of leadership, of a transformation of history and self” (2013, 10). As a modality, play can illicit not just learning and self-understanding but also critical reflection on the form and content of such processes (Milojević and Inayatullah 2015). In this way, play can be used to engender an alternative ontological comportment—a being-in-the-world where one enacts a new game. From this purview, I use games to assemble a Latourian arena for play-based experimentation. In the sections that follow, I critically reflect on my journey as a futures practitioner using games and play. While the two projects are presented as "case studies," it is best, or perhaps even more fruitful, to engage them as the excogitations of a Latourian critic experimenting with and learning how to assemble efficacious arenas.

A practical choice

In June 2014, I was excited to confirm my participation in the *Climate Engineering Conference 2014: Critical Global Discussions,* which was organized by the Institute for Advanced Sustainability Studies in Berlin, Germany. I was keen to learn from leading scholars in the field and share a bit about my research trajectory, and I must admit that I thought Berlin in late summer sounded quite nice. Aside from having a paper accepted as

part of the "Climate Engineering & Social Engineering: Social and Technological Challenges in the Anthropocene" track, I proposed running a hands-on session using futures methods, which, at that time, were just gaining momentum and notoriety as a means of exploring potentialities for geoengineering. I was delighted to hear that my workshop proposal, *Postcards from the Future: Consensual and Contested Visions of Climate Engineering,* was welcomed, and the conference organizers actually offered travel funding. As fate would have it, I never made it to Berlin.

Around the same time, I had my first official engagement as a "foresight consultant" with UNDP, which took place during a regional innovation hub meeting in Istanbul, Turkey. Working with the UN was a professional opportunity and personal achievement that I simply could not pass up, and it was at this event that I was approached about taking on a project. The Tonga *foresightXchange* took place just two months later, and I began a professional relationship with the UN that continues to this day. While I did not know it at the time, my choice had as much to do with embracing practice as it did with being a practical choice.

Since 2014, I have worked as a "foresight consultant" with the UN in nine countries, predominantly across Eastern Europe and Southeast Asia. Many, if not most, of these engagements have involved direct and lengthy interactions with local residents. My own positionality as an "expert" paid by the UN to deliver a series of outcomes does much to shape how the

aforementioned engagements—most of which involved some type of futures game—have unfolded. Indeed, the notion that I am an "expert" is something that I consciously problematize. If given the opportunity to present either to UN staff or participants as part of the engagement, and this is not always the case, I often include the proviso: 'the' future does not exist, so no one is an expert.[87] Accounting for my own privilege and the means by which I have directly and indirectly shaped outcomes through a range of design choices has led me to emphasize the necessity of co-designing. In theory, this creates attentiveness toward the immediate context, but, in practice, this also complicates the overall process as some decisions, especially those made by UN staff, have a host of unstated and implicit motives. Indeed, working through and under the auspices of the UN raises a litany of issues, especially within communities where atrocities have unfolded under the aegis of the statist paradigm. Consequently, my relationship with the UN as a practitioner is complex and beset by a range of contradictions. In the next two sections, I map how two engagements shaped my approach to games while providing additional reflection on my development as a practitioner.

[87] This riffs of Dator's 1st Law of the Future, which states that "the" future cannot be predicted because "the" future does not exist. I have often followed up with an aphorism attributed to Foucault: "I'm no prophet. My job is making windows where there were once walls." Interestingly, Foucault also said, "In the struggle of men, nothing important ever passes through windows but always through the triumphant collapse of walls" (Tanke 2009, 90). To date, I have never invoked the latter in a professional engagement.

Playing with the UN: Tonga

In recent years, the United Nations (UN) system has implemented an aggressive effort to deploy futures, although foresight is often their preferred term, as part of its overall innovation agenda. One of the groups leading on this approach within the UN system was the United Nation Development Programme's (UNDP) Global Centre for Public Service Excellence (GCPSE), which was a jointly funded initiative with the Singapore government focusing on innovation within the civil service. In June 2014, I was contracted by GCPSE to lead the Tonga *foresightXchange*—a joint venture between the Prime Minister's Office, Government of the Kingdom of Tonga, and UNDP with logistical and financial support from UNDP in Tonga, the UNDP Pacific Centre, and UNDP's Innovation Facility. The 2014 Tonga *foresightXchange* was made up of three connected events:

1. Public event held on 19 Aug 2014 in Nuku'alofa featuring an introduction to strategic foresight, futures literacy and an array of foresight tools;

2. Private event for the Government of Tonga held on August 22, 2014 in Nuku'alofa providing an overview of the results from the public event; and

3. A side event at the Third United Nations Conference on Small Island Developing States (1 September 2014 - Apia, Sāmoa) with presentations from His Excellency the Prime Minister, Lord Tu'ivakano; Helen Clark, UNDP Administrator; Masagos Zulkifli, Senior Minister of State (Foreign Affairs and Home Affairs), Singapore; and Dr. Jim Dator, Emeritus Director, Hawai'i Research Center for Futures Studies.

On Tuesday, 19 August 2014, the first, and largest, event of the 2014 Tonga *foresightXchange* took place in Nuku'alofa—a workshop for 100 citizens to imagine their preferred future for Tonga. Once word spread about the event, attendance ballooned to somewhere between 110-130 participants. The theme for the event, which was set by GCPSE staff, focused on shifting the governing narrative: "From Small Island Vulnerability to Big Ocean Prosperity." In preparation for our mission, which was the first time in country for almost everyone, our team was put into contact with a local facilitator whose primary task was to offer insights as to how we might best engage participants and localize our processes.

During one of our team calls, we were told that the Planning Ministry often conducts consultations with rural villages and remote island communities, but this process is often informal and limited in scope. In short, a representative from the government speaks to the oldest male in the village for 45 minutes and then leaves. Seeking to disrupt this dynamic while also fostering an engaging space for cultural and traditional content to emerge, the *foresight eXplorer* was designed to help participants imagine their preferred values, behaviors, and structures for Tonga's future, specifically in light of the narrative shift from "From Small Island Vulnerability to Big Ocean Prosperity." Functioning as a simple game using pre-defined and blank cards, the *foresight eXplorer* uses a

hex-based design to emphasize interrelations while also providing a clear constraint—as it is only possible to make six connections per card.

Participants could either select predefined cards or create their own content in each category, and many, if not most, groups generated content in Tongan using blank cards. Participant-generated content was integral to localizing the overall process, especially as all of the game cards were printed in English only—an extraordinarily unfortunate result of the project's rather short lead-time. If there is one aspect of this project that continues to haunt me, it is this. As a practitioner who has worked in a range of contexts, I find it unconscionable that participants were presented only with English-language content, although it was certainly the case that a majority of the dialogue at each table actually happened in Tongan. In spite of the event being dual-language, the imposition of language, and by extension meaning, points toward the implicit and all-too-explicit challenges in the consultant-driven model often used for such events.[88] In Figure 5 (below), one can see how participants used the *foresight eXplorer*, which also included a board to guide play.

[88] Indeed, if given the opportunity, it is my preference to work with local practitioners and employ a "train the trainer's" model. While this approach has been adopted for some of my engagements with the UN system, it continues to rely on the external consultant model for many, if not most, of these types of projects.

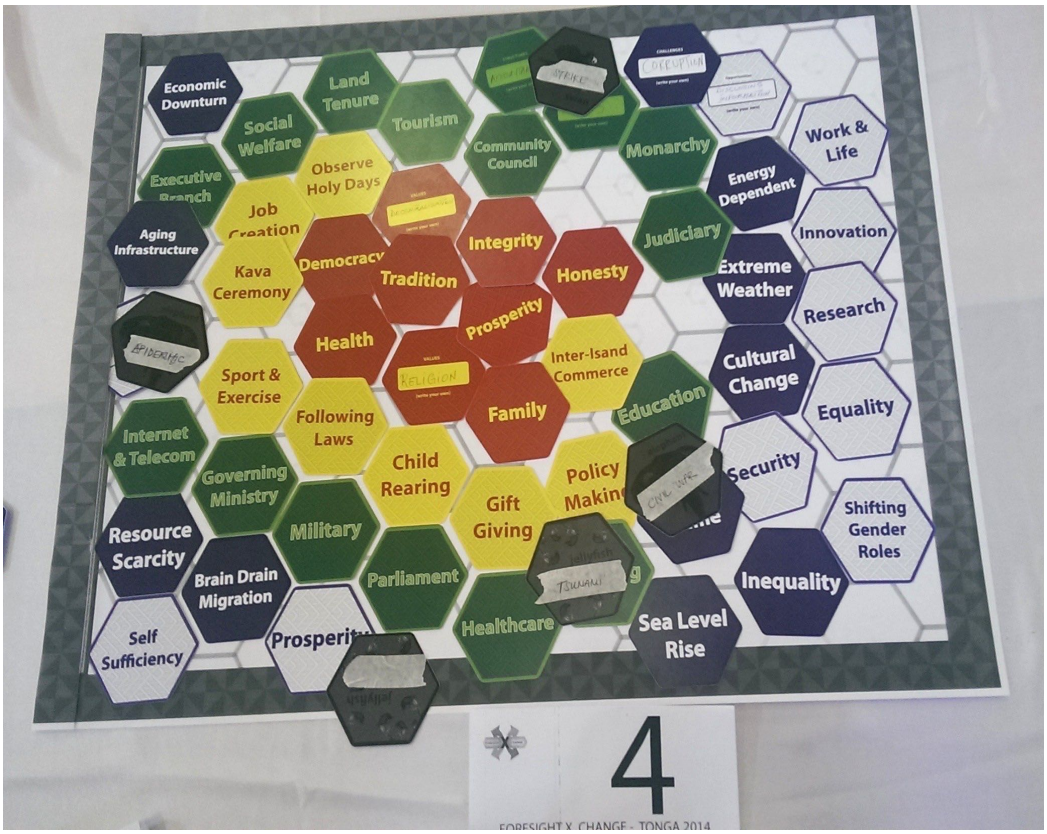

Figure 5: Tonga foresight eXplorer final outcome

After connecting values, behaviors, and structures, participants added both challenges and opportunities to provide more depth and complexity. Additionally, participants were asked to generate emerging issues as a way of concluding the game and as a setup for the next exercise, which focused on narrative development through a persona. Overall, feedback from participants and observers indicate that the public workshop was well received, and this likely has as much to do with the open nature of play. In short, players build our scenarios as a collaborative mosaic—one where complex relationships and interconnections are realized through the

placement of cards.

Pre-created content for the game was developed in consultation with UNDP and its government partners, and one of the key questions that arose during this process was whether or not to include Tonga's four core values: *Fefaka'apa'apa'aki* (mutual respect); *Feveitokai'aki* (sharing, cooperating, and fulfillment of mutual obligations); *Lototoo* (humility/generosity); and *Tauhi vaha'a* (loyalty/commitment). These are closely associated with the nobility, and although Tonga has made great strides to democratize, it continues to be a highly striated society. The decision to omit these values was predicated on the hypothesis that such an interjection might lead to performative responses, which is to say that we did not want participants to choose values they thought should part of Tonga's future but rather those they wanted to define a preferred vision. The top three values used during the event were prosperity, family, and health. In hindsight, it appears as though our decision not to include the core values was justified, and this speaks directly to the often complicated and contentious means by which such processes are designed. As a practitioner, one must make choices that condition outcomes but also exchanges between participants, although it is impossible to anticipate every possibility. In order to contain play within a certain time, each group was assigned a minimum of one facilitator, and many groups had two—one proficient in Tongan and another with experience facilitating such

exercises. All groups worked at their own pace during the 90-minute session, but only three created and placed wildcards, which was the final stage of play. One of the primary challenges related to using the *foresight eXplorer* is data capture. Unfortunately, high-quality images of each board were not taken, which means that some details were invariably missed. This highlights another key learning: the process *is* the product. Indeed, it would be impossible to provide anyone who was not in the room with a snapshot of the affective dynamics that surrounded the creation of particular content, and this learning has shaped how I see games as a tool for not only producing alternative results but also staging engagements between participants.

While I have intentionally focused on the *foresight eXplorer*, it was only one part of a series of exercises and engagements that created the event. As one of the aims of the overall gathering was to reimagine how a new narrative for Tonga might be realized, it felt important, if not necessary, to involve artists. This further supported the event's implicit aim to change not only what was being discussed but also how discussions were held. Rather than use a "visual recorder," who draws a cartoon version of the meeting, we engaged a local artist collective who literally wandered in and out of various groups during the public event. They "absorbed" content by listening as the tables completed the day's exercises, including the *foresight eXplorer*, which was the centerpiece

activity. In my conversations leading up to the event with Tevita Latu, who heads the collective and produced *Island Ethics* at the event, he expressed surprise that the UN would "use games and art" for "these types of things."

In addition to produce an original piece, each artist was asked to provide a short reflection. Latu's "description" is quite powerful in how it articulates the complex and even contradictory imaginaries underlying Tongan society, which the *foresight eXplorer* helped to surface. He reflects:

> The noble paramount parents of Tonga are the church and state. On the left is the mother – or the church – with the obligation to establish the flag of morale (which is the Christian morale), peace and the spirit of unification in the society. On the right is the father – or the state – who governs and takes care of the economy. The constitution was drawn from Godly facts with the hope that they will not be separated from the impact of development. Inside is a Tongan who wears a *sisi lousi*, which indicates our culture. The Tongan's identity is formed while being raised at home, but includes the influence of other sectors of society on the upbringing. The black cloak at the back is the church, which is a refuge and protector. On it are new designs which is the outcome of the combination of ideas with our relatives abroad. Slow change is what we prefer and this applies also to our language, which is displayed by the new Tongan words. The fish represents our export of live ocean organisms abroad like pearl and sea cucumber. Export can be sustainable if we are to utilise it reasonably today. It is possible to find oil in the ocean floor in the future with improved research equipment. I have drawn the fish meat as a machine which represents the idea of high technology, which brings the light of education and new innovations that will ease the way forward. At the top is a light representing education, which is required for sharp increase in research and knowledge for new ideas and trading with overseas markets (Appendix 1).

Results from the public event were collected and reported directly to the government during a private session with the Prime Minister and his cabinet, who were a bit surprised to see a game accompanied by artwork produced by local artists. My report, which was made publicly available, is available as Appendix 1 and provides more detail on specific outcomes as well as the artwork created at the event.

Findings and results from the pubic event were also put forward at the Small Island Developing States Conference held in Sāmoa later that year. Although the event received praise from government, specifically the planning minister, the *foresight eXplorer* was not institutionalized or re-deployed as a means of public engagement. As a means of making this potentiality more real, a Tongan-language edition was produced and made available shortly after the public event. As an arena for experimentation, the *foresight eXplorer* appears to have been an effective tool for critically exploring imaginaries and imagining both possible and preferable futures. Although there was no post-event survey, both GCPSE and its government partners directly expressed their overall satisfaction. As for participants, four of the seven editions of the *foresight eXplorer* were "lost" at the public event, which suggests that at least some attendees wanted to keep playing.

Playing with the UN: fYR Macedonia

Based on the strength of the Tonga *foresightXchange*, I was again contracted through UNDP to lead an engagement as part of the development of a long-term strategy for water management in the Strumitsa river basin in southeastern fYR Macedonia. At this time, I had been "living" in Montenegro, which is another former Yugoslavia republic, for a few months, so I felt comfortable taking on this project. From the outset, however, my playful approach was contested at the highest level. This phrasing resulted from a somewhat tense meeting—my first in the country—with the UN Resident Coordinator (RC) in fYR Macedonia, who expressed concerns over the usage of this approach, which she thought might be seen as trivializing the region's somewhat serious needs relative to generating evidence to use for the strategy development process. I agreed with her sentiment and manufactured the term "enhanced survey tool" to ease concerns about the UN being seen as "playing games." This moniker was used throughout the multi-month project and spilled over into subsequent UN engagements.

For the Water for Life (W4L) project, the *foresight eXplorer* was substantially redesigned to suit the local context and specific needs of the W4L project, which was comprised of three series of events:

1. A prototyping session held in Skopje on October 14, 2014;
2. 10 multi-stakeholder workshops held in each of the region's six municipalities from October 15 – December 12, 2014;

3. A final event to report W4L results held in Strumitsa on December 15, 2014.

The aim for each multi-stakeholder workshop was to generate insights and data on the key challenges and opportunities surrounding the Strumitsa region. Indeed, the overall scope of the W4L project could have not been more different than its predecessor. Whereas Tonga had an explicitly qualitative approach, W4L was far more quantitative in its overall purpose and outcomes.

A local firm was contracted to facilitate all W4L workshops in Macedonian, and simultaneous translation was provided for the final event. Following Tonga, I made it clear that dual-language or even full-Macedonian events were not a mere preference but rather a necessity. Workshops were organized in both rural and urban municipalities, including Bosilovo, Konce, Novo Selo, Radovis, Strumitsa, and Vasilevo. In total, 210 people attended one of the workshops, and 83 citizens, including some participants from previous events, came to the final workshop. At every workshop, groups completed a scorecard after each round of play leading to 397 unique entries from 84 gaming sessions (two per group) run during the 10 workshops. This immensely aided with data capture.

Although the W4L *foresight eXplorer* used the same basic model for play (hex cards organized by category placed in a specific order) as the Tongan version, significant changes were made to the surrounding

workshop structure as well as the core elements of play. In contrast to Tonga, participants used the *foresight eXplorer* twice during a half-day (about four hours on average) workshop. In the first session, participants were asked to work collaboratively on the challenges and opportunities of the present. Key prompts for this session were:

- What Challenge will have the most impact on the Strumitsa River Basin today?
- Which Action best fits with one of the Challenges?
- Which Resource most relates to the Challenges and Actions in play?
- Which Stakeholder is most impacted by the Resource or can act to solve the
  challenge using a specific Resource?

After a short break and a brief presentation on “futures literacy,” which stressed the importance of moving beyond probability and plausibility in imagining futures, participants were asked again to use the *foresight eXplorer*, but instead focus on 2020 (Miller 2007). Key prompts for this session included:

- What Wild Card do you think will have the biggest impact on the Strumitsa region in 2020?
- What Opportunity do you think can have the biggest effect on the Strumitsa region in 2020?
- What Resource do you think is most critical to a Stakeholder & Action relationship in play?
- What Challenge best connects with the other cards in play?

Although I would have rather preferred to use the term "emerging issue" rather than "wild card," this decision was conditioned by the complexities of translation.

One of the biggest shifts from Tonga to fYR Macedonia was the introduction of tokens, which generate another layer of data and, perhaps most importantly, offer a non-verbal means of exchange and engagement between the players. After each player placed a card, players were asked to weight cards using tokens during each round. Figure 6 (below) shows the tokens, which were red colored, placed on the cards.

Figure 6: Macedonia foresight eXplorer

In placing tokens, players were asked to identify the card or cards that would have the biggest "future impact," which is an intentionally amorphous and subjective qualifier aimed at stimulating dissent. For example, "Evacuation of Local Population" was a player-generated card created in the Opportunities category. It emerged three times in three different workshops (Bosilovo, Novo Selo, and Strumitsa C), and received

weightings of 6, 7, and 10 on a scale of 3-12 (minimum to maximum). Although this card did not have a high frequency throughout many workshops, the strength of its weighting, as well as the fact that it came up in three different workshops, demonstrates its prevalence within regional imaginaries. Further detail surrounding this particular example helps to frame how token weighting leads to more complex and contextualized imaginings, which further strengthened the tool's overall efficacy as a means of engagement and experimentation. In the Bosilovo workshop, the wildcard played just before "Evacuation of Local Population" was "Turia Dam Destruction." In the Novo Selo workshop, the wild card played just before was "Ilovica Mine." In the Strumitsa C workshop, the wild card played just before was also "Ilovica Mine." During the W4L project, the Ilovica Mine was under construction, and its looming presence clearly had an impact upon local imaginaries. While the Ilovica Mine was expected to create jobs, citizens were clearly concerned about potential environmental impacts, although comments from the facilitators suggest that it was not discussed substantively. This highlights a key learning: non-verbal gestures and mechanics, such as token weighting, provide a means to surface dissenting perspectives.

As an "enhanced survey tool" emphasizing collaboration and discussion amongst multi-stakeholder groups, the efficacy of the W4L *foresight eXplorer* clearly rested in its deployment as a facilitated

workshop exercise. The degree to which it operates as an actual "game" is relative to the degree to which one emphasizes the win condition, which seemed unimportant, if not completely irrelevant, to many, if not most, workshop participants. As with other engagements, data capture remained a significant obstacle, especially given the complexity of the outputs, but the scorecard system and close facilitation worked well enough to generate a range of outputs. My report, which was made public, is available as Appendix 2 and provides more detail on the overall event as well as an analysis of the outcomes. At the beginning of each workshop, the participants were told that their feedback would enhance the tool itself, and, according to colleagues at UNDP fYR Macedonia, the *foresight eXplorer* was deployed for another project focusing on urban resilience two years later, so it seems as though the experiment is ongoing.

As with the Tonga edition, facilitators took digital photos of each group at each workshop, but many were difficult to read. Content for the W4L *foresight eXplorer* was adapted from the European Commission's programme of measures for water management, which appears to have been overly technical for some participants. Clearly, there was a great deal of "local" knowledge, and meshing this with the game's pre-created content varied by workshop. The degree to which one utilizes technical or more general content to build out a game such as the *foresight eXplorer* points toward the necessity of localization and, perhaps most importantly,

experimenting *with*, rather than on, the participants. Indeed, assembling an efficacious arena for experimentation is tantamount for facilitating a safe space for participants to critique, create, and contest as they see fit. Were it not for my engagements in Tonga and fYR Macedonia, I cannot say for certain that games would have featured so prominently in this project. These specific projects shaped both my awareness of the complexities of engaging with participants as well as how the modality of play can and might be used as a means to shed light on imaginaries and experiment with futures. In the next section, I provide a brief overview of a game that I co-developed for the European Commission's Joint Research Center, which resulted in the release of an open-source gaming platform that features the Menagerie.

Elephants, swans, and jellyfish...oh my!

Human maturity: this means rediscovering the seriousness we had towards play when we were children.
- Friedrich Nietzsche (2001, 62).

In 2014, the European Commission's Joint Research Center (JRC) inaugurated its Policy Innovation Lab by creating a serious game, which was given the title: the JRC's Scenario Exploration System (hereafter JRC SES).[89] Built as an engagement tool for a scenarios project on moving toward a sustainable EU by 2035, this "foresight gaming system" walks

[89] Based on previous engagements, Dr. Aaron B. Rosa and I were contracted to work with JRC researchers to co-develop the JRC SES.

players into alternative futures by staging a series of actions and challenges. In advancing toward 2035(s), players simultaneously uncover aspects of pre-created scenarios but also expand and deepen each alternative future's narrative arc through interactive gameplay. Experiencing, or rather co-creating, an unfolding scenario is an explicit aim of the game, which uses role-play to highlight the range of perspectives one might take on what constitutes a "sustainable" EU and how such a lofty goal might be achieved. In addition to providing each player with a unique role, such as EU-level policymaker or private sector, the JRC SES has a "gamemaster," who facilitates the experience and captures data. Although the game has since been repurposed to create other editions, there were certainly some lessons learned along the way.

While much, if not most, of the feedback on the JRC SES was overwhelmingly positive, one aspect is worth scrutinizing further. As Bontoux et al. explain, "It was clear that in cases where there was limited time after the game had finished, players often didn't fully understand the process and the effects of what they had just gone through" (2016, 105). This suggests that the gamemaster role is not a luxury but rather a necessity, and the game only "works" when one has adequate time to debrief, which is to say that there must be a space to reflect on the overall process. Given the somewhat technical and specific nature of the content, this should perhaps not be surprising. With that said, this game was

designed as an engagement tool for audiences beyond the confines of the EC. Following my experience as one of the co-designers of the JRC SES, I was extremely interested in playing with different game dynamics and creating a tool that had wider applicability. In 2015, I designed an open source game based, in part, on the JRC SES model. In the remaining pages, I provide a brief overview of this tool, which features the Menagerie. I then reflect on how play-driven approaches, such as the 2X2 SES, can draw on tools such as the Menagerie to produce powerful and, ultimately, efficacious affects.

The 2X2 SES, which is built on the two uncertainties scenario modeling method, provides a generic framework for moving participants into the future(s).[90] The GBN Matrix method, which selects two intersecting uncertainties and/or drivers of change to create four quadrants, is considered to be one of the most popular and widely used scenario modeling methods (Schwartz 1991; Millett 2003; Bishop et al. 2007). Although the limits of this approach are evident in its reductive framing, the method's ease of use and plasticity provides fertile ground for experimentation (Curry & Schultz 2009; Ramirez & Wilkinson 2013). One of the greatest challenges of this tool is finding the most contextually appropriate means by which to expand and explore the content and parameters of each quadrant. With the above in mind, I designed the 2X2

[90] Appendix Three contains my original design brief for this game, and it provides the requisite context for the remainder of the chapter.

SES for a mutant form of "incasting."

Coined by Dator to capture the experience of workshop participants inhabiting and enlivening alternative futures, *incasting* is a process ‘‘designed to increase the flexibility with which people plan for the future, and to increase their creativity in making use of both opportunities and challenges emerging from change’’ (Curry and Schultz 2009, 49).[91] As Jones explains, *incasting* applies abductive reasoning to the assumptions of a particular “image of the future” as a means of identifying the systems inherent to that scenario’s *world* (Jones 2002). In my mutation of *incasting*, one’s aim is not merely to deduce “plausible” parameters and systemic conditions but rather to enter *into* the world of the image of the future under analysis. As a means of surfacing both actual and perceptual framings, *incasting* complicates how alternative futures are understood, which has led some to critique its efficacy. As Serra argues, *incasting* has more to do with seeing the future from alternative perspectives than it does with the “feasibility of any given future” (Serra 2013). Although Serra characterizes this as *incasting’s* weakness as a method, I envisage this aspect as a strength to enliven dissent, which, as previously noted, is a means of keeping the future a space of possibility, rather than mere plausibility, as well as ensuring that politics remains at the fore of such

[91] Per a personal correspondence, Dator has moved away from using “incasting” and now uses “deductive forecasting,” using the “seven driving forces matrix,” he argues that it is possible to deduce alternative futures for any issue or phenomena (Dator et al. 2015).

imaginings.

As with the JRC SES, the 2X2 variant employs time horizons (5-10-20 years) as a means of creating spatio-temporal dynamism—simply put, staged content to further the scenario. Players assume a role, create a vision or goal within the constraints of the scenario, take actions toward the achievement of their individual vision, weight their own actions with resource tokens, and then reflect on the overall "future impact" of the actions of others using another set of tokens. Once everyone has taken a turn, the "winning" player introduces either a Black Elephant (what are most people missing or not seeing?); Black Swan (what do people think would never happen?); or Black Jellyfish (what can or might lead to chaos?). This model continues for each of the three rounds and culminates in two "win conditions." In quantitative terms, it is possible to calculate which player received the most "future impact" tokens, and this simple "scoring" element stimulates competition. In qualitative terms, players discuss who amongst them was the closest to achieving her vision, which opens up a more exploratory exchange. While the first "win condition" often provides a good laugh, the second is, without question, the most critical and illuminates the tool's implicit learning outcome: the impotence of linear planning, policy, and strategy approaches. Invariably, few players achieve their vision, which illuminates how the 2X2 acts as a hybrid finite/infinite game.

The 2X2 SES is very much a finite game in that it has a discreet start and finish. The game ends when players reach the final horizon, scores are calculated, and the players discuss the results. On the other hand, it becomes clear during play that mixing up the axes and randomizing the usage of the Menagerie moves the 2X2 SES more towards an infinite game in scope. Indeed, in the numerous versions of the 2X2 SES that I have designed for a range of clients, someone has always asked, "Can we keep playing?" From my perspective, this simple query always deserves a positive response, but it is sometimes the case that the allotment of time does not permit multiple sessions. In principle, I aim to have players work through at least two quadrants (or scenarios) using the same role, which reinforces the different potentialities that can and might arise given each scenario's overall logic. There is another, perhaps less obvious, aspect of the 2X2 SES that positions it as an infinite game, and this involves the Menagerie directly. If the aim of the Menagerie is to enliven alternative ethico-political imaginaries, then there are an innumerable number of potential subject positions from which to model black elephants, black swans, and black jellyfish within and across the quadrants. The aim, then, of elephants, swans, and jellyfish at play is not to exhaust all possibilities but rather to unframe such potentialities—to move one toward the unthought. This is where the Menagerie playfully enacts Nandy's game, and this is precisely where dissenting visions come

to the fore—in assembled arenas for *trans-subjective positionalities* to compete, cooperate, and collaborate.

Conclusion: Facts and concerns at play

I began this chapter by exploring Latour's distinction between *matters of fact* and *matters of concern.* Charting the plight of Ioane Teitiota to achieve refugee status in New Zealand, I showed that this division has real-world consequences and metaphysical implications. Furthermore, this distinction provided a point of entry for games to be employed as a critical and creative mode of engagement. I then reviewed how games function as a tool for using a modality of play, which can and might act as an affective heuristic for learning and engagement. Through a practice-based reflection on two "case studies," I charted the challenges and opportunities of using games within a workshop setting. I then looked at how the 2X2 SES playfully deploys the Menagerie as a means of eliciting radical potentialities and fostering dissent. As a practitioner using the modality of play, I have learned *how one might play*, which is to say that my allegiance as a futurist toward the possibility-space is, in no small part, driven but also enacted by playful modalities.

In the next chapter, I begin by looking at how games might (and might not) support systems thinking, which is integral to futures as an approach. I then offer a design brief that outlines the scope, setting, situation, scenario, stuff, audience, structure, setup, content, and

gameplay of *GeoFutr*—an alternative futures-driven gaming platform designed to critique, create, and ultimately contest geoengineered imaginaries. Finally, I offer a critical reading of the Oxford Principles as a means of setting up my vision of a politics for geoengineering.

Chapter 5: A Game for All Seasons

Curious results

In 2014, the Polar Learning and Responding: PoLAR Climate Change Education Partnership at Columbia University's Barnard College developed EcoChains: Arctic Crisis. The game focuses on helping players learn about interconnections amongst the Arctic's marine food system, the role of sea ice in maintaining a balance amongst different species, and challenges and changes to this landscape. In the game, players must strategize to sustain as many species as possible, which also involves maintaining sea ice reserves, by building food webs. EcoChains is one of a recent number of serious games aimed at spreading science beyond the classroom and laboratory.

Receiving funding from the National Science Foundation to create the game, the PoLAR Hub has made a concerted effort to assess the impact of such projects—an actual requirement related to its funding. In 2015, a small controlled experiment (n=41) was run to compare the learning gains between EcoChains and more traditional methods, specifically a "magazine-style" article featuring comparable content. Researchers sought to reveal which format (game versus article) would produce more robust outputs in a few key areas:

Knowledge of Climate Change and the Arctic Region

- Does the educational approach affect immediate gains in

knowledge and longer-term retention of knowledge?
- Does the educational approach affect self-assessments of learning and gains in knowledge?

Attitudes and Beliefs about Climate Change and its Impacts
- Does the educational approach affect attitudes toward climate change, the Arctic region, and humans' role in and responsibility for climate change and the Arctic region?

Information-Seeking Behaviors
- Does the educational approach affect engagement and motivation to engage with climate change information and resources?

Systems Thinking
- Does the educational approach affect level of systems thinking about the Arctic region and ecosystems?

Impressions of and Engagement with the Intervention Experience
- Do level of engagement with and/or enjoyment of each educational approach differ?
- Does level of engagement with the educational approach affect knowledge, perceived knowledge, attitude, behaviors and systems thinking? (Pfirman et. al 2015).

In addition to a follow-up survey carried out four weeks after the experiment, participants in this study were also given questionnaires and a mapping exercise to complete as a means to demonstrate "systems thinking," which is the capacity to map the connections between parts, specifically, in this instance, the various parts of the Arctic ecosystem.

According to the results, game players demonstrated greater and more diverse subject matter recall than those who simply read the article, which is to say that the game led to greater understanding of the content (Pfirman et. al 2015). As EcoChains relays somewhat technical content in a decidedly playful way, this outcome is especially interesting—not to mention relevant when thinking about how to design a game on geoengineering. Students who played the game also showed more

attachment to the subject matter, which is evidenced by a clear majority stating that they had an increase in knowledge about how they might personally and individually help protect the Arctic region. As Pfirman playfully points out, EcoChains suggests, "new information is 'stickier' when gained through game play than through traditional approaches" (Pfirman 2015).[92] Interestingly, while the game created more engagement and learning, it did not surpass, or equal, the article in fostering “systems thinking," which is the primary driver of gameplay. Indeed, as the overall aim of the game is to manage the Arctic ecosystem, this result is rather curious, and the team behind EcoChains postulates that this somewhat surprising outcome has much to do with the fact that the article contained a complete systems map of the Arctic region as with the variable nature of content that arises during gameplay.

For many in futures, this outcome might raise an eyebrow as many, if not most, contemporary futures methods, and scenarios in particular, invite, if not necessitate, a systems thinking approach. It certainly seems contradictory that the players retained more information but had trouble "mapping" what they learned. When correlated with feedback from the JRC SES, EcoChains raises an interesting issue related to my design:

[92] While EcoChains induced “stickiness,” it is unclear if this dynamics extends to other games, contexts, and topics. Overall, there is a lack of critical analyses of games and gaming approaches, particularly within futures, and I specifically address this in the section on future(s) research trajectories. I am thankful to Dr. Jim Dator for raising this important matter of concern.

what comes after? If my game aims to act as a replacement for exercises performed during a scenario-modeling workshop, then something must come (before and) after. While I have designed such processes, as evidenced by the two case studies, I have intentionally limited my scope in this chapter to focus solely on the design of a game, although I address this issue in the section where I provide my vision for a *politics of geoengineering*. In the next section, I explore how object-relation mapping (ORM) and experiential futures situate my design and inform my approach to deploying play.

Situating play

In seeking ways of creating a game that opens up spaces of radical possibility and moves players toward the unthought, the materialist turn has proven to be an invaluable resource. In 2014, Banks published "Object-relation mapping: A method for analysing phenomenal assemblages of play," which calls attention to the ways with which play gets constructed through a network of relations. ORM draws heavily from ANT and opens up the "phenomenal assemblages" that constitute gameplay. As Banks explains:

> ORM [empowers] the human actor (the player) to define the site, taking words in their personal accounts of play as conspicuous traces of objects and object-relations in that site, and providing a structure for analysing assemblages across various play spaces and materialities (Banks 2014, 7).

As my game is a physical object intended as a replacement for exercises

carried out at a scenarios modeling workshop, it is worth considering the game's materiality—the structure of the board, card designs, and choice of other elements. In contrast to other approaches, ORM is acutely attentive to the variety of relations, as well as scales, from which play can and might unfold. Presencing macro, meso, and micro-scale phenomena, ORM offers not only a means to analyze games, which was the author's original intent, but also a guide for how one might design a game. Given how some other games have struggled to engender systems thinking, my particular interest in ORM centers in how it might brings one's attention to the different scales at play within geoengineered imaginaries. What scalar traces might be realized through play? How might the game explore the relations surrounding and underlying geoengineered imaginaries? How might attentiveness to various relations, human and otherwise, help to foster dissent? How might attentiveness to scale enliven a politics for geoengineering?

An acute awareness to scale, as well as an emphasis on engagement, inspired the rise of experiential futures, which is an intellectual and practice-based movement that formalizes, theoretically speaking, the wide array of participatory approaches and concretization strategies used primarily, but not solely, by futurists to move people to feel different and thinking openly about the future(s). Although I have already invoked, and problematized, experiential futures in relation to pre-created

scenarios, I want to return to how this approach stages affective engagements as it helps to situate my design within a broader movement born from futures.

Noting the interconnections inherent to futures and design-based approaches, Candy and Dunagan explain:

> The breadth of experiential futures as a design space makes it a suitable conceptual and generative container for those less concerned with particular media or arts traditions than with catalysing high-quality engagement, insight, and action to shape change, using whatever means fit the situation (2017, 3).

Experiential futures features “tangible, immersive, interactive, live, and playable modes” to simulate, literally speaking, a possible future or futures within the present (Candy & Dunagan 2017, 2). My primary interest rests in "playable" modes of engagement, specifically how such means can bring "*into being different worlds as our attention comes to them*" (Candy & Dunagan 2017, 14). Invoking attention illuminates the importance of percepts and affects in such engagements—indeed, one might say that this approach sets out to "game" the brain. With that said, the "win" condition of experiential futures is “thinking and feeling future possibilities,” which is to say that the actual game being proposed via this method is infinite in scope (Candy & Dunagan 2017, 3).

As a means of coalescing this approach into a tangible and usable framework, Candy and Dunagan created the "Experiential Futures Ladder," which shows the nested framings that one can and must consider

when instantiating the future(s). At the broadest level, one finds the *setting*, which refers to the general context and framing of the future(s). One level down one encounters the *scenario*, which is a more specific articulation of the future(s), typically in narrative form. At the third level, the *situation* is where circumstances and/or events are staged so as to elicit an affective response. Although not part of Candy's original framework, *stuff* has been included to account for the tangible things and artifacts that often form points of entry for such engagements. Image 4 (below) shows an updated graphic representation of the ladder, which also includes the designation of an "experiential threshold" (Candy and Dunagan 2016; Candy and Dunagan 2017). As with any other tool or method, theory and practice are symbiotic but not synonymous, which is to say that the threshold, as previous anecdotes suggest, is as subjective as it is contextual.

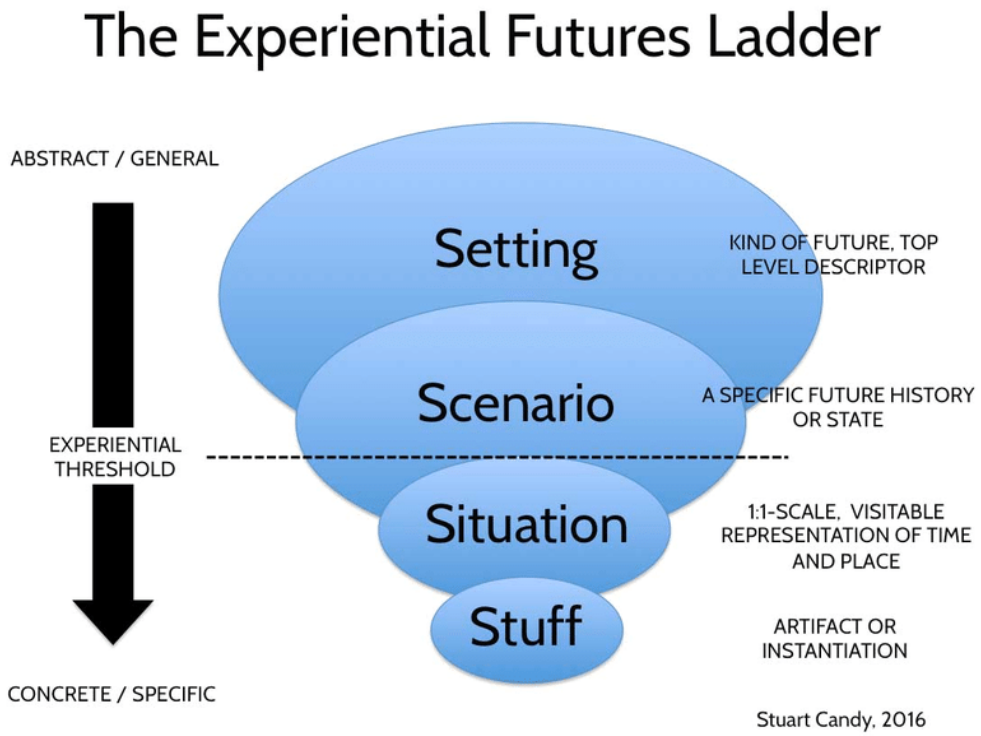

Figure 7: The Experiential Futures Ladder

In using experiential approaches, it has been my experience that the development process and subsequent delivery necessitate a high degree of agility and fluidity. As with games, with whom and where one plays has an extraordinary affect upon what can and cannot be played *with*. I find the addition of the threshold to the ladder instructive, as this is precisely where I aim to locate my game design, which blends setting, scenario, and situation. I have also instantiated an artifact, or stuff, although this does not figure directly into gameplay. In terms of the design itself, experiential futures has challenged me to think about what can be

designed and what can and ought to be random, serendipitous, and uncertain. It is very much the case that one cannot (and should not attempt to) design for all potentialities, as earlier anecdotes and the two case studies suggest—games are uncertainty incarnate. They must be given life through play and reflect the dynamics of the world(s) around them. Given the aegis of postnormal times, randomness figures prominently into my design, although I remain acutely aware of its potential pitfalls. As Costikyan explains:

> Randomness thus has strengths: it adds drama, it breaks symmetry, it provides simulation value, and it can be used to foster strategy through statistical analysis. It has countervailing weaknesses: in excess, it imbalances games, it can foster a sense that success is a consequence of luck rather than excellent play, and it can produce frustration when a streak of bad luck affects a player (Costikyan 2013, 86).

Playing a game when one knows the outcome is anathema to play itself; indeed, it is precisely *not knowing* the outcome that ignites play. The challenge, then, is to craft an engagement whereby player choices have an impact but also remain subject to larger forces as well as the moves of other players. In short, it is essential to find a balance between ignorance and uncertainty in terms not only of content but also play. As with all other games, one makes a move not knowing fully what the results might be, although every move is always pregnant with assumptions, expectations, and hope. Capturing this design dilemma succinctly, Costikyan observes, "In general, designers rarely think about the tuning of perceptual

challenges, but perhaps they should; one way to make any game more difficult, after all, is to make it harder for the player to perceive precisely what action they must take at any given time" (Costikyan 2013, 101-102). Again, finding the requisite balance between deciding what action one might take and not knowing its outcome is central to my design.

Player perceptions has been at the fore of my thinking, and my choice to create a game, rather than alternative futures scenarios, has much to do with staging an interactive and affective means to enliven a politics for geoengineering. Central to this politics is an awareness of the recalcitrant uncertainties and ignorance surrounding and shaping geoengineered imaginaries. Again, Costikyan elucidates, "games require uncertainty to hold our interest, and that the struggle to master uncertainty is central to the appeal of games" (2013, 2). While this is very much the case within a finite game, infinite games necessitate a different sort of mastery—one more aligned with axioms and assumptions surrounding PNT. In my design, this "mastery," which is more akin to navigation, is enlivened through the Menagerie, which the participants enact by imagining innovations, disruptions, shocks, threats, uncertainties, and even ignorance to continue, complicate, frustrate, and alter play via “outside” positionalities. As with my previous engagements, pre-created content merely sets the stage for improvisation, and my design intentionally offers openings for players to change the game.

The variable nature of play might frustrate some, but this is another means to enliven, as well as enact, an exploratory politics centered on experimentation. As with some of my previous engagements, my design balances learning versus localizing, and as geoengineering is the focus of play, the design must achieve a relative harmony between technical content and creative imagining, although the underlying themes—centralization, corporatization, and commitment—are certain to be familiar to some, if not many. In the context of geoengineering governance, these forces dominate much of the debate and, consequently, geoengineered imaginaries, which is why they have a prominent role in the game. In the next section, I provide a design brief that outlines the scope, setting, situation, scenario, stuff, audience, structure, setup, content, and gameplay of *GeoFutr*— an alternative futures-driven game designed to critique, create, and ultimately contest geoengineered imaginaries.

Design brief

Communicating gameplay is not easily accomplished via textual means. This design brief offers a point of entry for understanding the depth and complexity of a gaming experience designed as a facilitated exercise for a scenarios workshop setting. In the sections that follow, I outline *GeoFutr's* scope, setting, situation, scenario, stuff, audience, structure, setup, content, and gameplay while also invoking the theoretical framings and concepts developed throughout this project. Welcome to

GeoFutr. Figure 8 (below) shows the logo I created for the game that illuminates the stakes as well as foreshadows the global, yet interconnected, aspects of gameplay.

Figure 8: GeoFutr logo

Scope

GeoFutr takes place in an alternative future—one where geoengineering is being hotly debated.[93] The when (time horizon) of this future is intentionally undefined. As with the Three Tomorrows (3T) method, which blends extended present, familiar future(s), and unthought future(s), the game invites and challenges participants to reflect on the

[93] In relation to the "Mānoa School" scenario modeling method, which uses the archetypes of growth, disciplined, transform, and new beginnings, the game blends aspects of each, although the players ultimately define the contours of the scenario (Dator 2009; Dator 2014). With that said, the blending of both driving forces and themes creates the potentiality for various archetypes to emerge within a single gameplay session. In the section of the conclusion on future(s) research trajectories, I propose integrating other scenario modeling methods, including the "Mānoa School" approach.

possibility of such a future as a *tomorrow* by treating the game as an actuality in the here and now. The immediacy of this future is made evident through the utilization of known entities, namely the United Nations (UN). This also supports the game's global context, and the degree of localization that arises during play is reliant upon both player roles and the exchanges that arise during play. Consequently, this particular element is left to chance, although the game prompts specificity with regards to place through various prompts.

GeoFutr's primary scope is critiquing, creating, and ultimately contesting geoengineered imaginaries by "incasting" alternative futures. As such, the game explores the actual (uncertainty) and perceptual (ignorance) dynamics surrounding geoengineering and its underlying imaginaries. To achieve this end, *GeoFutr* uses two driving forces (uncertainty and ignorance) and centers on three predominant themes within the ongoing geoengineering debate: centralization, corporatization, and commitment. As a tool for experimentation, the game materializes a *politics for geoengineering* by staging ethico-political provocations, which emerge through interactions between the players. In this way, the game is a Latourian arena for participants to assemble and the emergence of dissent, which is facilitated through play, materializes a *politics for geoengineering.*

Audience

As the game is currently only available in English, this dramatically limits its reach. With that said, the game was designed for a general audience, although having some familiarity with geoengineering certainly aids in making play more dynamic.

Setting

The United Nations stands at a crossroads. The myriad effects of climate change have driven millions from their homes and ushered in an era of political and economic uncertainty. Champions for geoengineering have lobbied for immediate deployment. In spite of increasing high-level interest in this "remedy," many still feel that the uncertainties surrounding such interventions prohibit implementation. Some researchers are unsure if the public has enough knowledge to make an informed decision. In hopes of bridging this gap, the United Nations has organized an aggressive campaign to bring together participants from around the world to offer their views, although they have been careful to maintain "neutral" ground.

Situation

As part of its engagement strategy, the UN has asked for specific inputs on potential research, possible implementation, and prospective governance. Using holographic virtual environs and real-time translation

technology, almost anyone can participate, although representative engagement on a global scale continues to be a challenge. As a means of disrupting its usual engagement tactics, the UN General Assembly ratified a proposal supporting random selection, although participants can delegate to someone else living in their locality. This has raised concerns over potential fraud, but all participants undergo a thorough biometric review process. All sessions are broadcast in real-time all around the world, and the public is invited to pose responses, questions, and comments during each session.

Scenario

Play involves “incasting” scenarios, which are constructed by randomly selecting key driving forces and themes. At one level, ignorance and uncertainty shape public perceptions of geoengineering research, proposals, and potential governance paradigms by acting as perceptual and actual constraints by which alternative futures can and might be imagined. At another level, the themes of centralization, corporatization, and commitment condition imaginaries by shaping much of the ongoing debate. During the setup stage, dice are rolled to determine the combination of the above elements. To allow for the investigation of truly alternative futures scenarios, the game employs a high/low dynamic to vary each of the themes and driving forces. Starting with ignorance and uncertainty, this leads to four possible scenarios, which are focused on the

geoengineering debate.

In centering the scenarios on the debate itself, the game offers a reflective means by which the players can imagine themselves as participants in a real-world discussion. When the three themes—centralization, corporatization, and commitment—are added using the same high/low dynamic, 32 scenario permutations are created, as seen in Appendix 4. This demonstrates how the game can be used to explore a wide array of possible futures. Each scenario, however, is a mere shell, and the players craft the actual scenario as the game unfolds.

Stuff

The game is materialized through a series of objects, including a board, cards, and dice. Additionally, I created an artifact from the future, as seen in Figure 9 below, to support further immersion. Designed as an invitation to play, this artifact introduces a fictional corporation, ROTAD CORP, who supported the UN by providing an artificial intelligence to help facilitate the engagement process. ROTAD CORP is used as a means to model the dynamics surrounding the Planktos incident, although the variable nature of gameplay does not ensure that it will arise during gameplay. As part of the game's pre-created content, ROTAD CORP is suggested to have carried out a legally ambiguous solar radiation management (SRM) experiment on Inuit land in Alaska. This provocation is shown in card form in the Content section of this brief.

Figure 9: Invitation letter artifact from the future

Structure

A "gamemaster" facilitates the experience and ensures that the basic guidelines of play are followed. Furthermore, the gamemaster acts as a guide to answer questions and provide clarifications about the pre-created content. In principle, which is not the same as practice, the game master should be familiar with the pre-created content. Aside from the gamemaster, *GeoFutr* features two types of player roles. Four players take on the role of an "Official Participant," who have been invited to play

by the UN. Some roles have been pre-created, such as “Community Elder” and “Unemployed PhD Graduate,” but there are also blank cards so any of the “Official Participant” players can create their own role. As part of the game, “Official Participant” players are asked to provide depth for her role. A fifth player takes on a very different role: the “Public Voice.” This role functions as the game’s primary *provocateur* and uses the Menagerie to actualize the unseen, unspoken, and unheard by introducing a range of issues, which might take the form of innovations, disruptions, shocks, threats, uncertainties, and even ignorance to continue, complicate, frustrate, and alter play. “Official Participant” players make statements in response to challenges and weight the impact of responses, which can receive support from the “Public Voice” player.

Content

GeoFutr uses different categories of cards to carry out gameplay. Role cards provide prompts for “Official Participant” players to create more depth and complexity for their subject position. The range of roles used in the game can dramatically alter how play unfolds. As a means of diversifying exchanges between players and promoting a rich experience that covers all three themes—centralization, corporatization, and commitment—a pre-created deck of Challenge cards introduces a range of challenges, issues, and obstacles. These cards are randomly distributed to the “Official Participant” players and cover a range of

aspects, including research, implementation, and governance related to geoengineering. In support of covering these aspects during play and highlighting the three themes, “Official Participant” players use Statement Cards to share their views. These cards prompt players to provide insights from local perspectives. While “Official Participant” players are expected to make an oral statement, the cards provide a medium for them to write out their thoughts, which also offers a means to capture data. Figure 10 (below) shows the design for Role, Challenge, and Statement cards. Blank cards are also available for each, so players may create unique content, which adds to the range of potentialities that might arise during play.

The main act of play for the “Public Voice” player features the use of Menagerie cards, which serve to invoke the dynamics of postnormal times (PNT) throughout the game. Introducing Black Elephants (contradictions), Black Swans (complexity), and Black Jellyfish (chaos) at the outset of play as well as at the beginning of each round, the “Public Voice” player exercises an extraordinary amount of influence on the game, especially as “Official Participant” players are expected to reference these cards as part of their subsequent statements.

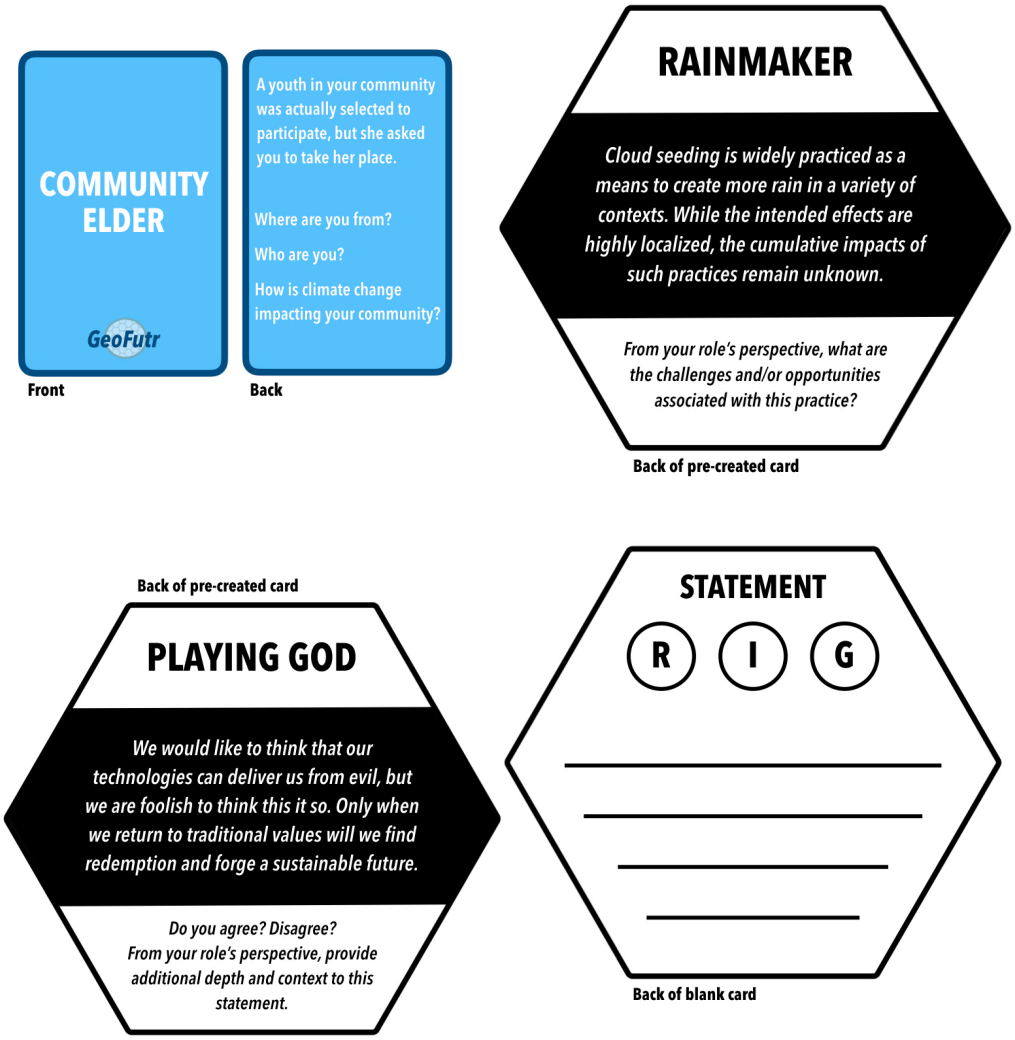

Figure 10: Role, Challenge, and Statement cards

Menagerie cards are location generic, and part of the function of the "Public Voice" player is to localize this content. As with other categories, the "Public Voice" player may select from a range of pre-created cards or create their own. The only rule for placing Menagerie cards is this: the "Public Voice" player must roll a 12-sided dice to determine a regional impact (Arctic, Central Asia, East Asia, South Asia, Southeast Asia, South

Pacific islands, North Pacific islands, Central America, North America, South America, Western Europe, Eastern Europe). This ensures that the game is both global and local in scope. Figure 11 (below) shows an example of a Menagerie card as well as a blank version. In the example below, the pre-created Menagerie card is a Black Jellyfish, which focuses on chaos. As such, the card queries: Where is this event? For whom does this create chaos? How might this event impact the ongoing debate?

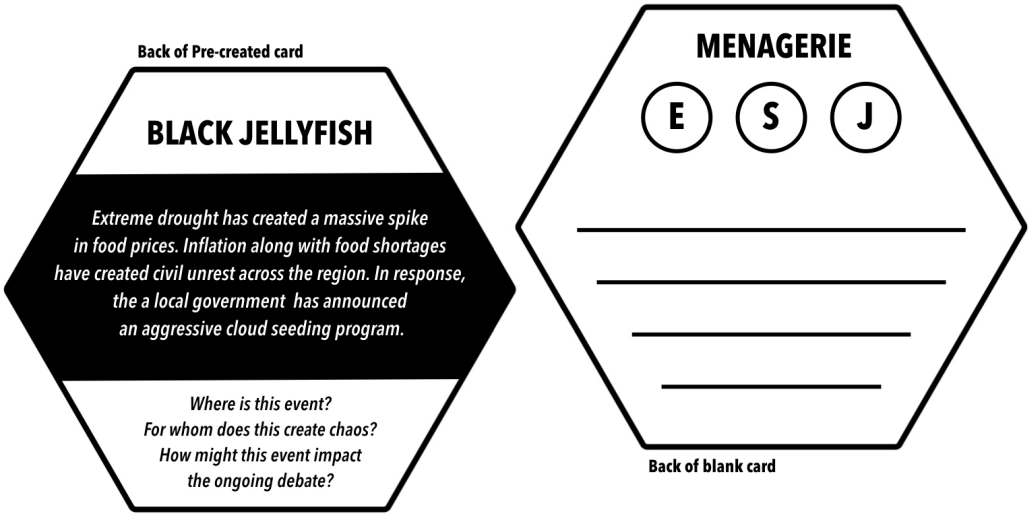

Figure 11: Menagerie card

Gameplay

The game begins when players listen to the Setting and Situation, which provides an introduction to the overall experience. Next, dice are rolled to select the scenario, which is then read aloud to the players. For the purposes of this overview, the following scenario has been selected: Uncertainty is high & Ignorance is low; Centralization and Commitment are

high and Corporatization is low. In narrative form, the gamemaster" might explain as follows: "In this particular scenario, uncertainty is high, but ignorance is low. This suggests that many, if not most, people are unsure of the effects and impacts of geoengineering, but it is also the case that the public, broadly defined, understands the technology and its risks. With regards to proposals for geoengineering research, implementation, and governance, there is quite a lot of debate on centralization and commitment. Corporatization, on the other hand, is not a major topic of discussion." Next, this scenario is placed onto the board, which helps to guide and direct play. Figure 12 (below) shows the layout of the board as well as the spaces where scenario content is placed.

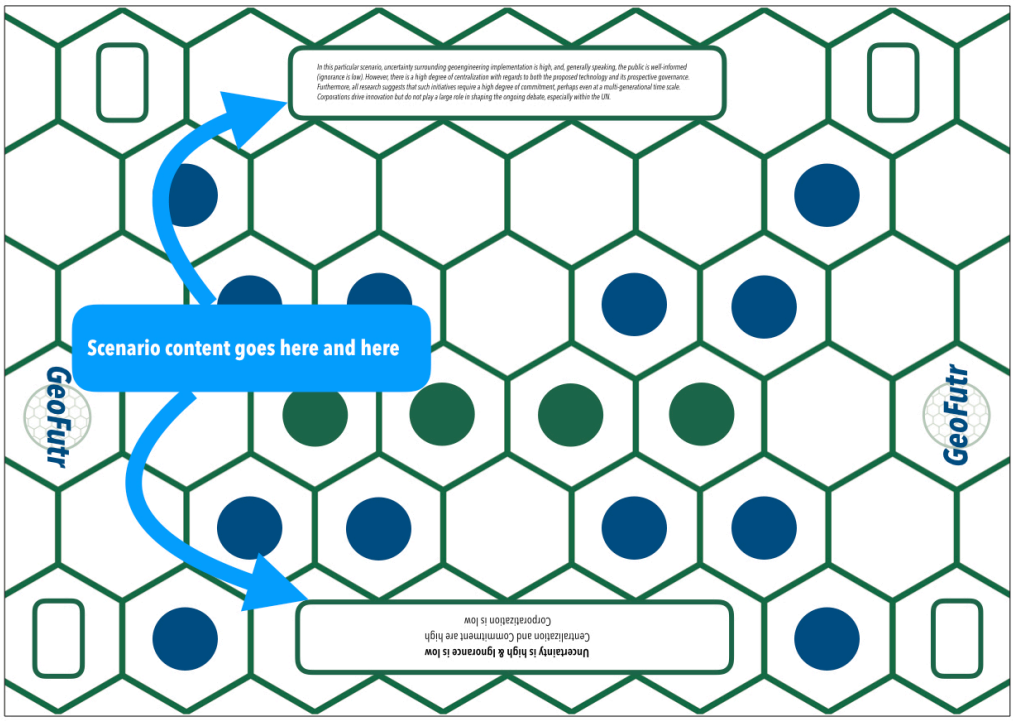

Figure 12: Board with scenario placement

When the scenario is added to the board, this provides an opportunity for the players to ask questions or seek clarifications. Should players “stray” too far from the scenario’s defining logic (i.e. the mix of driving forces and themes), the gamemaster can (and ought) to intervene, although this remains at her discretion and has more to do with one’s facilitation style as having players break with the scenario can provide a unique opportunity during the game’s debrief session, which immediately follows play and offers a chance for the players to reflect on their experience and learning outcomes.

Once all questions and clarifications have been addressed, “Official Participant” players create a role based on either a pre-created card or one of their own choosing. Depending on the roles chosen, gameplay can vary widely. In order to keep play variable, it would be best to have a mix of roles from various sectors: government, corporate, academic, nonprofit, etc. A diversity of roles would ensure that a wide array of topics and concerns are engaged. Once all of the “Official Participant” players have created a role, they share who they are with the other players. From this point forward in the game, they “are” their role. Immersion is central to the game as part of the debrief centers on asking participants to reflect on how much of what was played was “them” versus their “role.” This provides a direct entry point for working through the percepts and affects surrounding and underlying geoengineered imaginaries.

Next, the gamemaster explains the basic structure of play and randomly distributes two Challenge and Statement cards to each of the "Official Participant" players as well as a blank version, so players can choose what content they want to use. The "Public Voice" player is then asked to place a Menagerie card on the board. The aim of opening play with the Menagerie is to invoke the unseen, unspoken, and unheard from the outset. While "Official Participant" players maintain the same role throughout the game, the "Public Voice" player can invoke any and all subject positions when asking questions and placing Menagerie cards. This further supports the aim of using the Menagerie to engender *trans-subjective positionalities*. As previously noted, there is pre-created deck of Menagerie cards, but play would benefit immensely if the "Public Voice" player created a provocation that speaks to both the specifics of the scenario and the "Official Participant" roles. Figure 13 (below) shows the placement of both the Role and Menagerie cards on the board.

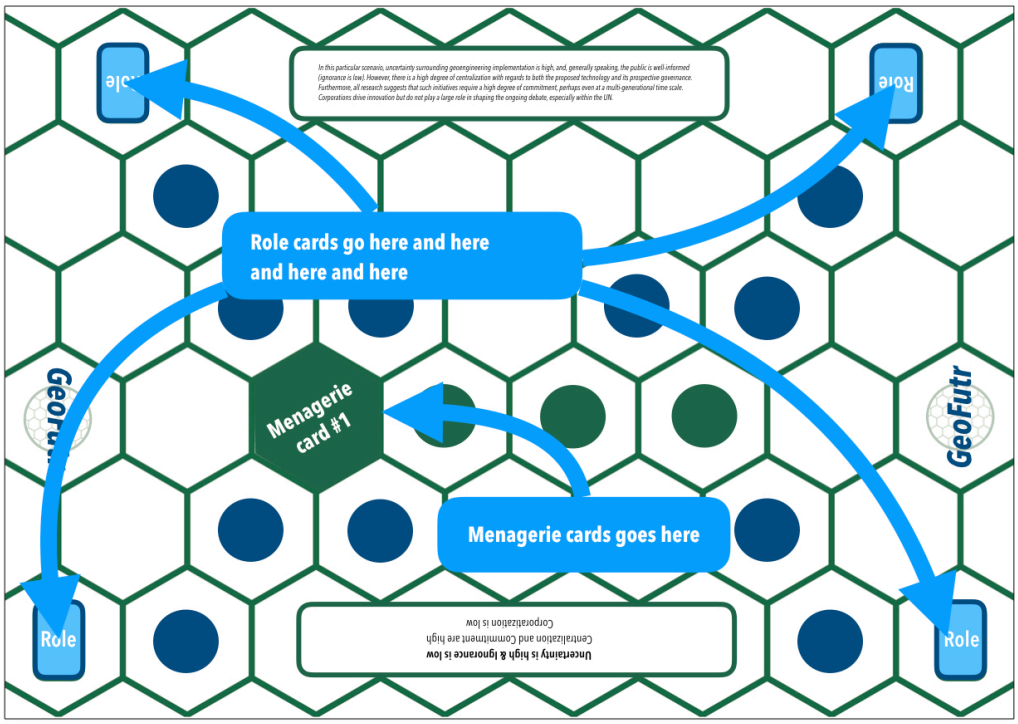

Figure 13: Board with role and Menagerie cards

After the first Menagerie card has been placed, “Official Participant” players roll dice to see who begins the first round of play. Challenge cards are sorted according to theme—research, implementation, and governance—and placed into three piles. When “Official Participant” players use a Challenge card, they roll the dice to determine from which pile they will select a replacement card. If a player wants another blank Statement card, they may purchase one using two “impact” tokens. The game’s token economy is explained in full on the next page. After placing a Statement card, all players have the opportunity to ask questions and seek out clarifications. The “Public Voice” player is expected, although not

required, to respond to each of the “Official Participant” players after each turn. Figure 14 (below) shows the placement of Statement cards on the board.

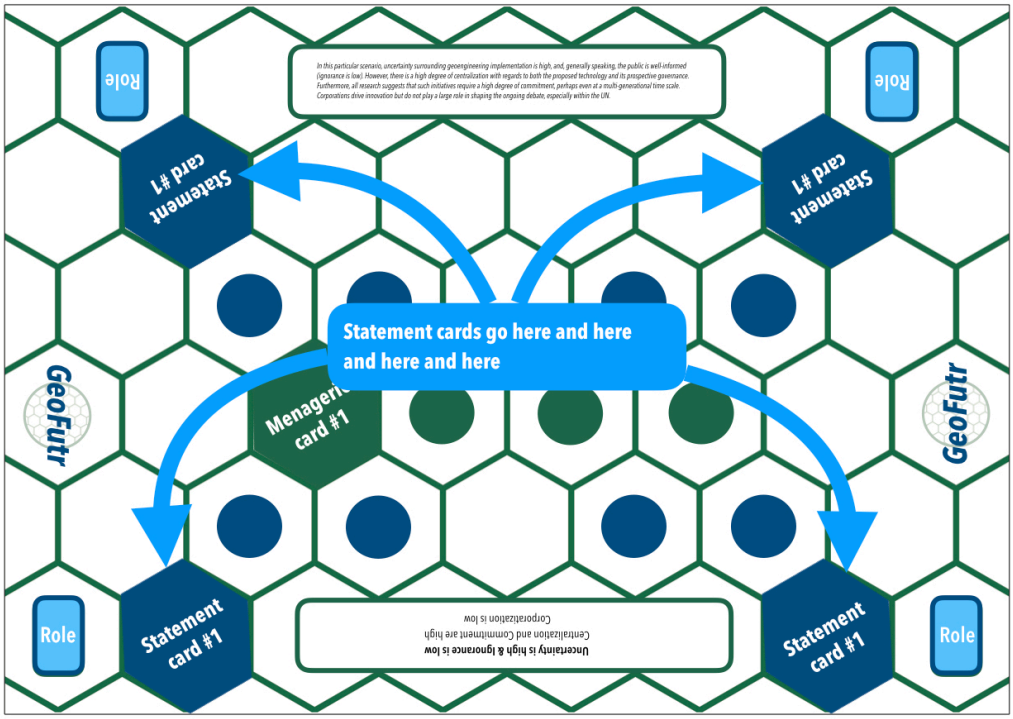

Figure 14: Board with statement cards

Once all questions have been answered, the “Official Participant” players take turns placing “impact” tokens, which offers a reflective, and non-verbal, means of engaging the ideas in play. Players can place up to three tokens (per round), which may be put on any card or cards. Simply put, the prompt for this act is: which statement or statements do you think will have the biggest impact? “Official Participant” players cannot place tokens on their own card, and each has a unique color token to identify

scoring. After “Official Participant” players place “impact” tokens, the “Public Voice” player places “support” tokens, which amplify (via multiplication) the weight of impact tokens.

Placing tokens provides both an “economy” for the game but also invokes competition, which can be useful for enhancing play experiences. The “Public Voice” player places five “support” tokens per round, and, as their name suggests, these tokens demonstrate a positive response from the public. The player whose Statement card has the highest score (impact multiplied by support tokens) starts play in the next round, which begins after the “Public Voice” player places another Menagerie card. This pattern repeats for two more rounds. Figure 15 (below) shows a completed gaming session.

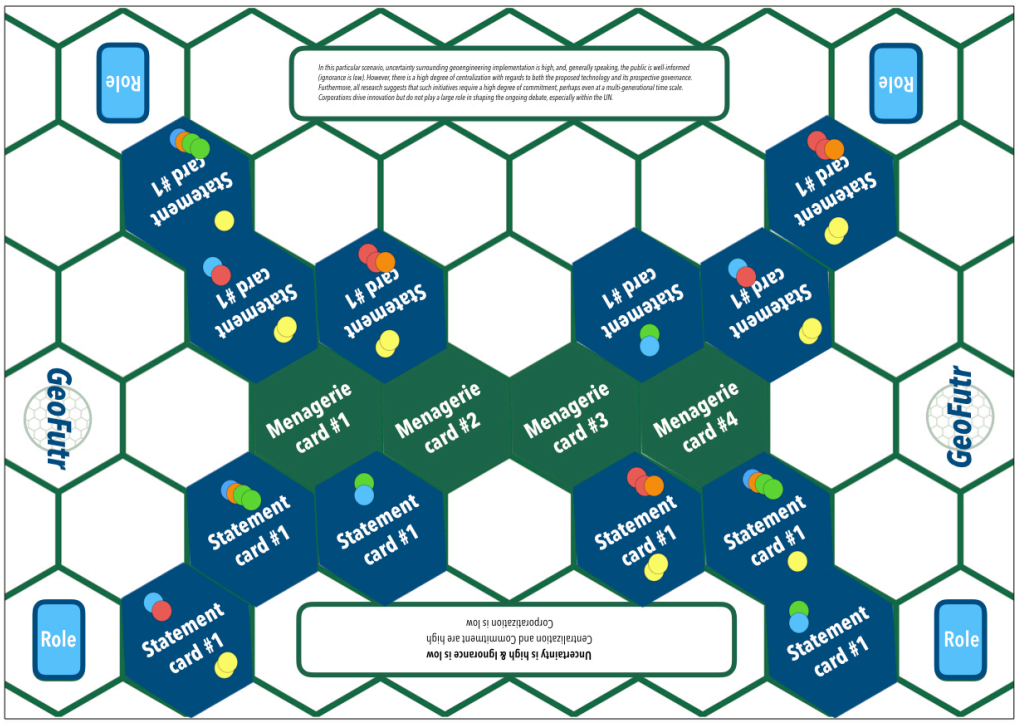

Figure 15: Board showing a completed game

Although the game offers a finite win condition, the possibility of playing other scenarios with unique conditions, situate the game as infinite. For the purposes of each session, the "winner" is the player whose cards received the highest score (impact multiplied by support tokens). In the event of a tie, the gamemaster may ask the "Public Voice" player to place three additional "support tokens" on the board.

Each game ought to conclude with a debrief session to isolate the main outcomes and results of play. Ideally, "Official Participant" players retain the same role for play in another scenario. This furthers the aim to "incast" scenarios, and play will likely be accelerated once the players

learn the rules. Following each gaming session, players are also encouraged to write a short narrative based on the game. In locating the game as part of a broader workshop setting, outcomes and results can be used for other exercises toward a range of outputs, particularly planning, policy, and strategy development processes.

While *GeoFutr* exploits the benefits of games and play as a conduit for creative engagement and experimentation, it also has many of the constraints of such approaches, particularly a high degree of variability, which is to say that no two gaming sessions are alike. In thinking about what might follow *GeoFutr* gaming sessions, it is most apparent that a visioning process to identify one's preferred future makes the most sense and fits with best practices in the field (Dator 2009; Voros 2003a; Hines et al. 2017). As the game centers on the aspects of research, implementation, and governance, a preferred future that speaks to the interconnections between these areas would benefit the ongoing debate, and some have already started to produce such statements. In the next section, I utilize Causal Layered Analysis (CLA) to analyze such a vision before offering one of my own.

A principled vision

Few institutions of higher education have invested as much energy into geoengineering as Oxford University, which runs a climate engineering research programme at the Martin School—an

interdisciplinary center focusing on the grand challenges of the 21st century. In a 2013 special issue of *Climatic Change*, the "Oxford Principles" for geoengineering governance were published in final form:

> *Principle 1: Geoengineering to be regulated as a public good.*
> While the involvement of the private sector in the delivery of a geoengineering technique should not be prohibited, and may indeed be encouraged to ensure that deployment of a suitable technique can be effected in a timely and efficient manner, regulation of such techniques should be undertaken in the public interest by the appropriate bodies at the state and/or international levels.
>
> *Principle 2: Public participation in geoengineering decision-making.*
> Wherever possible, those conducting geoengineering research should be required to notify, consult, and ideally obtain the prior informed consent of, those affected by the research activities. The identity of affected parties will be dependent on the specific technique which is being researched—for example, a technique which captures carbon dioxide from the air and geologically sequesters it within the territory of a single state will likely require consultation and agreement only at the national or local level, while a technique which involves changing the albedo of the planet by injecting aerosols into the stratosphere will likely require global agreement.
>
> *Principle 3: Disclosure of geoengineering research and open publication of results.*
> There should be complete disclosure of research plans and open publication of results in order to facilitate better understanding of the risks and to reassure the public as to the integrity of the process. It is essential that the results of all research, including negative results, be made publicly available.
>
> *Principle 4: Independent assessment of impacts.*
> An assessment of the impacts of geoengineering research should be conducted by a body independent of those undertaking the research; where techniques are likely to have transboundary impact, such assessment should be carried out through the appropriate regional and/or international bodies. Assessments should address both the environmental and socio-economic

impacts of research, including mitigating the risks of lock-in to particular technologies or vested interests.

Principle 5: Governance before deployment.
Any decisions with respect to deployment should only be taken with robust governance structures already in place, using existing rules and institutions wherever possible (Rayner et al. 2009)

The Principles come across as precisely the sort of measured and thoughtful guidelines that one might expect from an esteemed academic institution, but as we live in PNT, they also showcase the limits of "normal" approaches. As a means of analyzing the Oxford Principles, as well as setting up my own vision of a politics for geoengineering, I turn to Causal Layered Analysis (CLA) in the next section.

A new metaphor

In using CLA to analyze the Oxford Principles below, I made a point to use their language for everything other than the myth/metaphor layer, which is my own synthesis.[94] In not challenging or calling into question the predominant regulatory and policy frameworks whose binary structures make truly transformative practices and processes all but impossible to manifest, the Oxford Principles ultimately perpetuate a system whose defining crisis (e.g. climate change) has promulgated radical "remedies" (e.g. geoengineering). In suggesting that one should rely on "existing rules and institutions wherever possible," the Oxford Principles completely overlook past and present injustices and assume that such systems are

[94] I considered using Oxford University's motto: *Dominus illuminatio mea* (The Lord is my light).

suited to postnormal potentialities.[95]

Litany
Disclosure of research plans and open publication of results; understanding of the risks; integrity of the process; informed consent
System
Existing rules and institutions; appropriate regional and/or international bodies; state and/or international actors; robust governance structures
Worldview
Affected parties; publicly available; global agreement
Myth/Metaphor
"Normal knows best"

Appealing to the all-too-familiar, specifically the statist order, the Oxford Principles conceal, as well as reveal, a certain politics—one that struggles to confront the limits of plausibility, the banality of risk-based approaches, and the failure of traditional institutions to engender creative and critical dissent. Indeed, the principles make no mention of experimentation, or futures, and one gets the impression that a present-centric *consensus* is precisely what they aim to secure. It is certainly surprising that the Oxford Principles make no mention of "future generations" given the uncertainties surrounding some geoengineering proposals and the commonly, if not overly, used (and abused) discourse

[95] In their defense, Oxford has been around for almost 1000 years.

on sustainable development.[96] A spirited call for governance is made, but without any insight as to what such an entity or entities might be and/or do, which gives the impression that they may by nothing new.

In reading as doctrine crafted “by adults for adults,” the Oxford Principles illuminate the conservatism that haunts much of the geoengineering debate. As Hamilton argues, "Geoengineering is an essentially conservative technology, one whose political appeal risks obscuring its inherent faults” (Hamilton 2013). Awareness of geoengineering's faults, particularly its uncertain effects, has increased in recent years, but this has done little to quell enthusiasts. What such results have illuminated is the need to shift the relation(s) between public, science, and policy spheres. Arguing that emerging technologies require cautious and careful experimentation, Charo writes, "One might say that what we need are more roundabouts, four-way stops, and yellow lights to supplement our red-light, green-light regulatory system (Charo 2015, 385). Invoking new metaphors, Charo alludes to the need for new stories toward a transformative vision for a politics of geoengineering. Below, I use CLA to explicate my vision.

At the core of my vision is the contention that the binary nature of

[96] At present, a number of governments, notably Wales and Malta, have created positions aimed at giving voice to the needs of future generations . Furthermore, the Brundtland Commission defines sustainable development as that which “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland 1987).

existing policy and regulatory regimes must be transcended by more fluid and emergent processes aimed at the proliferation of possibilities and the intentional problematization of plausibility. If premised on play, dissent, and humility, a politics for geoengineering can and might transcend the binary frameworks endemic to traditional policy and decision-making practices. Beyond mere contestation, a politics for geoengineering can and might enact new pathways for public, science, and policy spheres to cohabitate, cooperate, and ultimately collaborate on potential research, possible implementation, and prospective governance.

Metaphor
Game on!
Worldview
Play; dissent; postnormal, ethical imagination
System
Speculative evidence; critics who create; arenas for participation; collective experimentation; unseen, unspoken, and unheard positionalities
Litany (newspaper headlines)
“Potential for geoengineering changed us, not the climate” “What are we doing? Keep playing to find out!”

Although I remain weary of the diffuse effects of climate change, my vision of a politics for geoengineering is intrinsically and, as Carse would have it, *infinitely* hopeful. As Stengers opines, “hope is the difference

between *probability* and *possibility*" (Stengers and Zournazi 2012, 245). As a game centered on proliferating the possibility-space, *GeoFutr* embodies and enacts this hope. Featuring a range of scenarios, and a gargantuan number of play combinations, *GeoFutr*, as well as games as a metaphor, might come across as nothing more than quicksand, or even mere child's play, to those invested in making "evidence-based" policy decisions, which speaks to the power of the systems layer. My vision of a politics for geoengineering aims to unframe such certainty and, perhaps most importantly, inject "speculative evidence" into such systems (Jain 2017).[97] Articulating the potentiality for such a shift, Stilgoe contends:

> [I]f we see geoengineering as a verb, under a regime of collective experimentation, things become less straightforward. Rather than prioritising freedom *from* experimental regulation, we might instead consider freedom in a positive sense, as a social licence to experiment. In addition to evaluating likely experimental risks and scales, we might also encourage scrutiny of experimental intentions and the imaginaries that sit behind them (Stilgoe 2016, 865).

Scrutiny is perhaps putting it mildly—my preference, in case it is unclear, would be dissent. In light of the Planktos incident, which can and must be seen as an experiment *upon* the Haida Nation, (neo)colonial proclivities within geoengineered imaginaries must be contested, confronted, and combated. A politics for geoengineering must commit itself to

[97] Until now, I have intentionally avoided using the frame of "anticipatory democracy," which is a term that was coined by Alvin Toffler in *Future Shock* (1970) and subsequently expanded by Clem Bezold in *Anticipatory Democracy: People in the Politics of the Future* (1978). While the concept generally refers to the capacity for forward-looking and participatory governance, anticipatory democracy has been closely associated with the US government, which is perhaps a result of the work of Newt Gingrich, who was an advocate for using futures—albeit for a specific political agenda.

experimenting *with* rather than experimenting *upon* and, perhaps most importantly, envisage experimentation as a creative, collective, and collaborative endeavor. Stilgoe's proposition to see geoengineering as a verb resonates with the processual approach of the materialist turn and games as metaphor. If a politics for geoengineering speaks of actants, then it starts to play a different game altogether. Again, Stilgoe observes, "Collective experimentation would value diversity and criticism as a source of resilience and variety, rather than dismissing dissent as 'anti-science', as is often the case in technological controversies" (Stilgoe 2015, 47). In diversifying its inputs, a politics for geoengineering must be open to inductive, deductive, and abductive modes of reasoning—it must assemble arenas where divergent ways of knowing and epistemological claims can have it out, so to speak. As Stilgoe suggests, a politics for geoengineering must also make its values clear and explicit if it is going to succeed in creating substantive change, which may or may not actually result in the realization of climate engineering as a coordinated enterprise or set of practices aimed at remediating climate change. In this sense, a politics for geoengineering has a greater aim—transform how we (humans) see ourselves in relation to the global climate system.

In sum, my vision of a politics for geoengineering is one where: uncertainty and ignorance are felt but not feared; that which is normal is viewed with apprehension but also humility; dissent creates and critics

assemble; plausibility takes a back seat to possibility; trans-subjective positionalities enliven engagement toward the unseen, the unspoken, and the unheard; and a different game is played all together.

Conclusion: A different game

I opened this chapter with a look at EcoChains, which complicates the results that one might expect to get from using a game. I then explored ORM and experiential futures to situate my design and raise some of the critical choices in designing a playful modality for collective experimentation. Next, I presented a design brief that outlined the scope, setting, situation, scenario, stuff, audience, structure, setup, content, and gameplay of *GeoFutr*—an alternative futures-driven game designed to critique, create, and contest geoengineered imaginaries. Finally, I used CLA to forge a new vision of a politics for geoengineering. In the conclusion, I provide a review each chapter's main arguments, reflect on my own positionality as a practitioner, highlight some of the contributions made by this project, and offer some future(s) research trajectories.

Conclusion: Let the games begin

The road so far

In the first chapter, I set the scene through an extended review of the Planktos incident. In carrying out his geoengineering experiment *upon* rather than *with* the Haida Nation, Russ George raised a litany of key challenges and sparked debate about climate engineering research, implementation, and governance. Based on my reading of the George incident, I situated geoengineering as a post-normal science and made linkages with postnormal times (PNT)—a recent movement within futures. While I received my futures education at the "Mānoa School," it is also the case that my professional work and research was shaped by working with Zia Sardar at the Centre for Postnormal Policy and Futures Studies. PNT opened both theoretical and methodological doors. Through a practice-based reflection, I then explored how scenarios might (and might not) function within a workshop setting, and this analysis provided a bearing toward games. As my research developed, it became clear that there was more at stake than just replacing pre-created scenarios with a game—an argument about the limits of a core practice of futures began to emerge. This reaches a crescendo in chapter three. Finally, I started to explore the contours for a politics for geoengineering and devised a pathway to commence my sojourn.

In chapter two, I linked geoengineering with the Anthropocene

debate, which speaks to the complicated ways with which we have come to understand and represent the global climate system. I then mapped the two large-scale climate engineering initiatives—primarily solar radiation management (SRM) and carbon capture and sequestration (CCS)—before reviewing a handful of minor methods, such as cloud seeding. Looking at different proposals and practices highlighted the importance of scale within geoengineered imaginaries, which are shaped by a confluence of things, including fictive imaginings. My reading of the cli-fi genre illuminated key themes—centralization, corporatization, and commitment—that point toward the ethico-political complexities underlying geoengineered imaginaries. Finally, I returned to the Anthropocene debate as a means of setting up my turn toward the *postnormal*, which offers not only a different means of understanding the present but also unique frames for imagining futures. Applying CLA and reflecting at a meta-level on this project, chapter two functions as the litany in moving through the top-layer texts and contexts that many, if not most, encounter geoengineering and geoengineered imaginaries.

In "Postnormal Futures," I confronted the uses (and abuses) of scenarios as the mainstay practice of futures. As part of my critique, I used both textual and practice-based research to show that scenarios, especially pre-created varieties, can be ineffective, even when delivered in creative and experiential ways. My ultimate contention is that pre-created

scenarios, especially within a workshop space, actually work against the ultimate aim of futures—to keep possibilities for the future(s) open. This argument was furthered by Nandy's vision of futures, which emphasizes the role of dissent in maintaining futures as a possibility-space. In recounting the development of the Three Tomorrows method and the formation of a new futures cone, I conveyed the importance of postnormal times (PNT) as an approach for complicating how we understand the present and future(s), which is evident in the difference between global warming and global weirding. My argument, then, is that futures needs PNT (enhancing how it engages with the contradictions, complexities, and chaos of the present) as much as PNT needs futures (an openness toward radical potentialities and the unthought). This line of thinking resulted in the concept of imaginings, which complicates "images of the future" by pointing toward the actual and perceptual forces that shape how we might envisage the future(s). Finally, I provided a detailed overview of the Menagerie, including a detailed analysis of the black jellyfish concept, as a means of enacting divergent perspectives —what I call *trans-subjective positionalities*. Invoking the unseen, unheard, and unspoken, *trans-subjective positionalities* offers a speculative means to situate dissent at the fore of collective experiments. Again, using the lens of CLA, chapter three operates at the systems level by focusing on the limits of plausibility within scenarios as a practice that has come to shape the geoengineering

debate and define futures as a field.

In chapter four, I opened with an explication of Latour's distinction between *matters of fact* and *matters of concern*, which invokes materialist and speculative framings to expand how *things* are seen and understood. Using the case of the world's first prospective climate refugee, I showed how the stakes in this division have both metaphysical and real-world consequences, as Ioane Teitiota was denied asylum and forced to leave New Zealand. I then used Latour's work to substantiate my turn to games, which is central to the form and content of a politics for geoengineering. Exploring how the modality of play can serve as both a strategy and tactic of engagement, I presented two "case studies" from my professional work with the United Nations in Tonga and fYR Macedonia. These cases highlighted how games operate in practice, which is always dissimilar from how they appear in theory—and this speaks to my development as a practitioner. Next, I revisited the Menagerie and provided further detail on the black jellyfish concept, which is a recent contribution to the futures field that builds on how emerging issues are identified and framed. Finally, I looked at how a previous game used the Menagerie as a way of eliciting radical potentialities and fostering dissent, which are essential to the concept of *trans-subjective positionalities* and central to my game design, which constitutes the bulk of the next chapter. In terms of CLA, chapter four moves to the worldview level mapping the ontological tensions at the

heart of the geoengineering debate and then positioning the modality of play as worldview.

In "A Game for All Seasons," I opened with a review of EcoChains, which produced rather curious results. Students who played EcoChains retained more knowledge than their peers who read an article, but the players showed less capacity for systems thinking, which is one of the central aims of the game. This outcome challenged me to reflect on the limits and constraints of my own game and, perhaps most importantly, what elements should be designed versus left to chance as part of gameplay. Invoking both object-relation mapping (ORM) and experiential futures, I charted a design trajectory using contours from both approaches. ORM called my attention to the different scales at play within geoengineered imaginaries. Experiential futures granted me a conceptual framework with which I could situate my game design as a futures tool. Using the and expanding upon the experiential futures ladder, my design brief outlined the scope, setting, situation, scenario, stuff, audience, structure, setup, content, and play dynamics of an alternative futures-driven game designed to critique, create, and ultimately contest geoengineered imaginaries. Finally, I critically analyzed the Oxford Principles, which offer guidelines for climate engineering research, using CLA as a point of entry for positing my own vision of a politics for geoengineering. My vision of a politics for geoengineering coalesces a

diverse array of theoretical alliances—futures, PNT, the materialist turn—and methodological commitments—assembling, experimentation, play—toward the realization of a difference game. Within the context of CLA, chapter five deconstructs the old metaphor so that a new one can emerge.

Succeeding by failing

I'm a pessimist about probabilities,
I'm an optimist about possibilities.
- Lewis Mumford

Life, as with games, often leaves much to chance. Success can sometimes come from failure. Futurists know this all too well. As Nandy observes, "Futurists change the future by changing human consciousness and, thus, the actualized future. Their very ability, to envision the future on behalf of the rest of us, sabotages their predictions. They succeed by failing" (1996, 637). Nandy's provocation strikes a deep chord, although futurists should not be in the business of envisioning the future on behalf of anyone. While I agree with Nandy's framing about changing consciousness and, by extension, the actualized future, futurists must do more to "sabotage" certain predictions (and imaginaries), which is a direct allusion to my explicit ethical positionality. With regards to geoengineering, this was and remains my intent. In general, I find the potentiality that geoengineering might 1) actually work; 2) be put forward as an absolute necessity; and 3) be enacted hastily all to be nothing short of terrifying. The geoengineering debate is multifaceted, complex, and

exceedingly technical—for many, if not most, the idea of active participation is implausible, improbable, and perhaps even preposterous. This dissertation offers an accessible, unique, and playful pathway in *GeoFutr*—an alternative futures-driven game designed to critique, create, and ultimately contest geoengineered imaginaries. While dissertations have a five-person audience, I intentionally sought to craft a narrative arc that might extend beyond academic discourse, and this speaks to the style of writing used throughout this work as well as my turn to games. As a practitioner seeking to foster dissent, gamemaster serves as my guiding metaphor, and this moniker does not imply absolute knowledge but rather exists as a term for one who facilitates gaming experiences. In this way, the gamemaster resonates with the Latourian critic, who assembles arenas for collective experimentation, especially via playful means.

As such, this dissertation is the equivalent of showing up to a raging party with a board game—*uninvited*. Some might not be bothered to put down their drink. Others might wonder what is in the box and be inclined to play. In either case, the presence of the game, and the invitation to play that comes with it, signals a different approach in how one might begin to understand the radical potentialities and unthought possibilities of geoengineering. To my knowledge, this dissertation offers the first research-based futures game designed specifically to critique, create, and ultimately contest geoengineered imaginaries. In this way, my project

resonates with Nandy's charge about the challenge at the heart of futures. Emphasizing the importance of pluralizing the future(s), he intimates, "The challenge of futures studies, thus, is to keep open the option of a plurality of dissent […]" (Nandy 1996, 638). In playing a different game, this dissertation makes a unique contribution toward proliferating a plurality of dissent, specifically alternative geoengineered imaginaries. Deployed as a provocation for those devising and enacting a politics for geoengineering, this work proposes that a different game be played. As a futurist, I would be remiss were I not to close with a consideration of future(s) potentialities for research.

Future(s) research

While I have recently published about how games can be qualitatively reviewed, I am interested in longitudinal studies to measure efficacy, impact, and more serendipitous outcomes. What metrics might be devised for such a study? Can the affects and impacts of play be measured at an organizational scale? Furthermore, my dissertation only tangentially engaged with video games, which was due to my focus on playful approaches as a means to transform workshop settings. Might video games, including those leveraging augmented and virtual reality environs, be a more efficacious mode of engagement? Myself and others have already "played" with blending mobile augmented reality with experiential futures and would like to perform further research on hybrid

approaches that leverage digital gaming platforms and technologies (Dator et al. 2015). As a means of owning the gamemaster metaphor, I would be interested in exploring how other scenario modeling methods, such as the Mānoa School approach, can and might be enhanced through approaches such as *GeoFutr*.

In addition to looking at mutations of various gaming approaches, I am also interested in what comes after. Although I briefly mention the placement of *GeoFutr* within a broader learning journey, I am interested in exploring approaches and tools that works toward the development of governance models. In achieving this aim, I would like to research systems and processes, such as Buckminster Fuller's World Game and modeling projects aimed at creating systemic views and assessments of global-scale challenges. Ultimately, I envisage this research as part of a separate book project that looks at how such approaches have been used within the broader futures field.

Finally, I would be remiss if I did not want to put *GeoFutr* in the hands of the geoengineering research community. As the game only exists in brief form, I would very much like to see a fully developed version in action, and additional research would be needed to flesh out a playable edition, which I can envisage being played at the next Climate Engineering Conference. Game on.

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